

A  
MECHANICAL ACCOUNT  
OF THE  
Non-Naturals:  
Being a Brief  
EXPLICATION  
Of the Changes made in  
Humane Bodies,  
BY  
AIR, DIET, &c.

TOGETHER,  
With an Enquiry into the Nature and Use  
of BATHS upon the same Principles.

To which is prefix'd,  
The Doctrine of ANIMAL SECRETION  
in several Propositions.

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By JER. WAINWRIGHT, M. D.

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The FIFTH EDITION, Revis'd.

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To which is added,  
An Anatomical Treatise of the Liver, with  
the Diseases Incident to it.

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*L. Pollock*

MECHANICAL ACCOUNT  
OF THE

Non-Animal:

EXPLICATION

Humane Bodies

AIR DIRT

With an Appendix to the Principles  
of the



The Dog

By J. Wainwright, M.D.

The North British

To which is added  
An Account of the Liver, with  
the History and

LONDON

Printed by J. Wainwright, at the  
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T H E

P R E F A C E.

**T**O attempt any Thing for the Improvement of useful Arts, especially that of Medicine, which is of the greatest Benefit to Mankind, is a Debt that every capable Person owes to the Publick; all Civil Societies having a Right to the Property of private Persons for the Common Good.

Whether the following Papers are like to answer that End, I leave to the Censure of capable Judges; for it is not every Pretender to Medicine, of how great Repute soever, that is a competent Judge of some demonstrated Truths. And tho' I do not confine myself to Geometrical Reasonings, yet I'm sure that he who understands not something of Euclid, is unfit to pass his Censure upon this Undertaking. I do not say that the Practice of Physick ever will be much less than it now is, the Object of Mathematical Certainty: But this I dare assert, That what Improvements there have been, or are likely to be made in the Theory of Medicine, are only under the Conduct of Arithmetick and Geometry.

## The Preface.

*A Humane Body is a curious Machine, and so far exceeds the Workmanship of the most Nice and Skilful Artificer, as Divine Wisdom surpasses the Understanding of a finite Mind; but yet it is subject to the same Laws of Motion, by which the infinitely Wise God governs the Universe. 'Tis compos'd of Solids and Fluids, both govern'd by the Laws of Gravitation, Impulse and Re-action, and what Changes are brought about in the Animal Oeconomy by the Motion of Matter, under the Conduct of these Laws, can no Way be estimated without some Assistance from the Mathematicks.*

*It is a Maxim universally receiv'd among Physicians, that Medicine should begin were Philosophy ends; and 'tis undoubtedly a necessary Qualification in a Physician, to be a good Philosopher; but all the Philosophy that has yet appear'd in the World, is no better than Trifling Romance, except what hath been writ by the famous Sir Isaac Newton, and some few others, who have built their Philosophical Reasonings upon Mathematical Principles. The wonderful Discoveries this Great Man has made by Geometrical Reasonings on Matters of Fact, are truly surprizing, and I question not but if the like*  
Me-



## The Preface.

*Method were made Use of for searching into the Causes of Diseases, and the Nature of Medicines by as good a Head, that a short Time would discover something as remarkable in our Little World, as that illustrious Author has done in the Great*

*We have some Earnests of what we may expect in this Way, from the Writings of Borelli and Bellini, and in our own Island the Learned Pitcarne, Mead, Cheyne, and some few others, who have made greater Discoveries in the Animal Oeconomy, than many Ages before can boast of. The Method these Gentlemen begun, I have pursu'd; and if what I've writ be of any Use to the 'Publick, 'tis a Recompence for my Labour; if not, I cannot help it, I am not the first that has been mistaken in his own Performances.*

*I have prefix'd, to the Book some Propositions concerning Animal Secretion, not only to save myself the Labour of frequent Repetitions, (having Occasion to refer to 'em so often) but because little or nothing has been said to the Purpose by any, on this Subject, except what we have in some of the forementioned Authors. Besides, there is no Part of the Art better deserves our Enquiry into, than the Doctrine of Secretion,*

## The Preface.

Secretion, since there are but few Distempers, which admit of a Cure without increasing or lessening some Evacuation.

To the Chapter of Air, I have subjoin'd some Thoughts of the Operation of the Bath, whether Temperate or Cold, upon a humane Body, and have accounted for the Effects of Bathing, from either the Weight and Cold, or the Warmth and Moisture of Bath-Waters. I have also calculated the Weight of Water we sustain in Bathing, and demonstrated, that the constant Expulsion of perspirable Matter, thro' the Pores of the Skin, is not sufficient to resist the Entrance of Water into the Body, when we bathe; and also shew'd how the Wearing of Flannel becomes prejudicial to weak People.

The other Parts of my Discourse fall naturally under their proper Heads. As to the Style, though it be rough, yet, if 'tis but intelligible, 'twill be enough for my Purpose. I must confess the Uncorrectness of the whole Work, which had yet been more so, had it not been for the Inspection of my ingenious Friend, Dr. Coats: But be it as it will, I'm sure it was design'd well, and may, if read without Prejudice, answer its Design, at least so far, as to excite a better Hand to correct its Errors, and supply its Defects.

Of

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## Of Animal Secretion.

### P R O P. I.

**A** *Fluid* must have its compounding Parts small, spherical, or approaching thereto, smooth, or such as can slide easily one over another, and if *Homogeneous*, the Parts must be of equal Density, by the 147th Proposition of *Borelli*, *De Motibus Naturalibus a Gravitate factis*.

### P R O P. II.

*Fluids* press *Undiquaque*, and the Direction of their Pressure is in every Point perpendicular to the Sides of the containing Vessel, and therefore *Secretion* is perform'd by a Composition of two Motions, one direct, and the other transverse.

### P R O P. III.

A *Heterogeneous Fluid* at Rest in the Body, and equally press'd, the most liquid Part is forc'd out first.

A 4

P R O P.



## Of Animal Secretion.

### PROP. IV.

A *Heterogeneous Fluid*, such as the Blood, whose compounding Parts are of different Densities, upon its Stagnation will percipitate its heavy, and elevate its light Parts, and they all in Time will take their Places according to their Specifick Gravities, and where the *Fluid* does not Stagnate, the Separation of the heavy Parts from the Light, will be in Proportion to the Slowness of the Motion of the *Fluid*.

### PROP. V.

The red Fibrous Part of the Blood, upon its Stagnation, retires into the Center, and forces the *Serum* to the Sides of the containing Vessel.

### COROL.

The slower the Blood's Motion is, the more *Serum* is separated.

### PROP. VI.

*Fluids* resist the Motion of such Bodies most, whose Surfaces are greatest, in Proportion to their Solidities, or in other Words, whose Specifick Gravities are the least.

PROP.

## Of Animal Secretion.

### PROP. VII.

The most viscid Parts of the *Serum* are lightest, viz. such as are separated in the Glands of the *Nose, Mouth, Palate, Windpipe, Stomach, Guts, &c.* being these swim in Water, which is lighter than *Serum*.

### COROL. to the two last PROP.

The most viscid Part of the *Serum* of the Blood is the least susceptible of Motion, or moved with the greatest Difficulty through the Arteries.

### PROP. VIII.

A *Fluid* forc'd thro' a Concave Cylinder, moves with greater Celerity at the *Axis*, than at the Sides, (*by the 215th Prop. of Borelli, De mot. natural. a gravitate fact.*) and much more so through a Concave Cone.

### PROP. IX.

(a) *Baglivi* hath observ'd the Motion of the Blood swiftest in the Middle of

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(a) *De Praxi Medica*, p. 398.

### *Of Animal Secretion.*

the Artery of a *Frog*, and therefore the most light Parts being less susceptible of Motion, will be forced to the Sides of the Arteries where there is the least Motion, so that where there is the least Motion, there will the lightest (being the most Viscid) (*by the 7th Prop.*) Part of the *Serum* be separated.

#### C O R O L.

The Viscidity of the separated *Fluid* will be reciprocally, as the Celerity of the Blood at the Orifice of the separating Canal.

#### C O R O L. II.

The Velocity of the Blood at the Orifice of the separating Canal, being as the Number of Plications in the complicated Artery; (*by the 40th Prop. of Bellini de motu Cordis*) therefore the Viscidity of the secreted Matter, will be as the Number of Plications in the complicated Artery.

#### P R O P. X.

When the Motion of the Blood is too slow, the most serous Part of the Blood is thrown upon these Arteries, which are the smallest, most complicated, or  
at



## Of Animal Secretion.

at the greatest Distance from the Heart. For the Motion of the Blood being too slow, more of the red Part of it will move along the *Axis* of the Artery, than before (*by the 5th Prop.*) therefore the red Part will move with much greater Celerity than the *Serum*, (*by the 8th and 9th Prop.*) and, consequently, thro' such Arteries where there is the least Resistance, *viz.* thro' the widest, the least complicated, and those nearest the Heart; for which Reason, the Serum will be forced upon such Arteries as are the smallest, most complicated, or at greatest Distance from the Heart.

### P R O P. XI.

A *Gland* is a complicated Artery (over whose outward Coat, as in all the Arteries and Veins, are Branches and Nerves to serve their spiral Contortion) which sends excretory Vessels out of its Sides, after which it degenerates into a Vein. This is Dr. *Cheyne's 1st Prop.*

### P R O P. XII.

The *Intestines* are a Gland, and the *Lacteals* are the secretory Vessels. This is Dr. *Cheyne's 4th Prop.*

### P R O P.

## Of Animal Secretion.

### P R O P. XIII.

The Orifices of the Excretory Vessels of every Gland are circular, being all the Vessels in which the Fluids of the Body move, are either Concave Cylinders, or Cones; for the Pressure of a Fluid being always perpendicular to the Sides of the containing Vessel, and being at equal Distances from the Center, the Sides must be every where equally distracted, *viz.* a Section perpendicular to the *Axis* of the Vessel, must be a Circle, and consequently the Vessel be either *cylindrical*, or *conical*. This *Prop.* is more fully demonstrated in Dr. *Pitcarne's Dissertation. de Circulatione Sanguinis*, &c.

### C O R O L.

The Orifices of the excretory Vessels of different Glands, differing only in their Magnitude, the Fluids separated in different Glands, will differ only in Degrees of *Cohesion* and *Fluidity*.

### C O R O L.

## Of Animal Secretion

### C O R O L. II.

Any peccant Matter in the Blood may be evacuated by any of the Glands, provided their Orifices be but sufficiently enlarged.

### C O R O L. III.

The increasing of one Evacuation will lessen another, and *Vice versa*.

### P R O P. XIV.

All the *conglomerate* Glands have Coats made of muscular Fibres, with which they force out their Contents by Contraction, and the more in Quantity, or the more forcibly any secreted Matter is to be expelled, the stronger are the muscular Fibres.

### P R O P. XV.

The relaxed Coat of any Gland increases the Viscidity of the secreted Matter, and *Vice versa*; for the secreted Matter will grow much more viscid by staying longer in the Gland, the thin Parts being evaporated by the Heat of the Body, the rest will be more viscid.

### C O R O L.



## Of Animal Secretion.

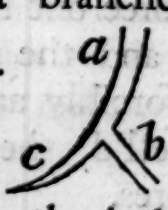
### C O R O L .

*Opiates, Drunkenness,* and whatever makes an universal Relaxation, increase the Viscidity of the Matter separated in all the *conglomerated Glands*.

### P R O P. XVI.

Such Glands, whose compounding Arteries are most complicated, secerne the most viscid Matter from the Blood.

#### *Demonstration.*

Let there be a branched Canal of the annex'd Figure,  and let the the Branches *c* be shut up, and the other Branch *b* be open, then, by an Engine force thro' the Trunk *a*, any Kind of viscid Liquor, such as the Blood, or whose compounding Parts are some more, and some less fluxil, and it will equally run into both the Branches, till the Branch *c* be full, but after that, what shou'd move through *c*, must pass thro' *b*, so that the whole Liquor, that passes thro' the Trunk *a*, must likewise, in the same Time, pass thro' the Branch *b*; now *b* being much straiter than *a*, the Liquor

## Of Animal Secretion.

Liquor must pass with greater Celerity through *b* than *a*, (by the third Corollary of the 10th Theorem of Mr. Keill's *Lectiones Physicæ*.)

So that such Parts of the Liquor, as are most easily moved, will first pass the Branch *b*, and the Parts that are least susceptible of Motion, or, in other Words, those which are most viscid, will be soliciting their Entrance into the Branch *c*; but this viscid Matter cannot enter without forcing some of the most moveable or fluid Part, of what is contain'd in *c*, into *b*, so that *c* will constantly fill with viscid Matter, till it can hold no more. If therefore the Extremity of the Branch of any Artery be totally obstructed, it is hereby disposed to fill with the most viscid Matter the Blood can supply, and that for this Reason, *viz.* because the progressive Motion of the Blood thro' that Branch must cease, and in such Branches of any Artery, where the Motion of the Blood is most retarded, thro' that Branch will the most viscid Part of the Blood pass, as the most fluid will in those Branches, where there is the least Resistance to the Motion of the Blood. Now, in every complicated Artery, the Resistance being greater than in a strait one,  
the

## *Of Animal Secretion.*

the Motion of the Blood will be slower, and that in Proportion to the Number of Plications in the complicated Artery; therefore, in the Arteries which are most complicated, the Motion of the Blood in 'em being the slowest, its Viscidity will be the greatest, and therefore such Glands, whose compounding Arteries are most complicated, secerne the most viscid Matter from the Blood, Q. E. D.

### P R O P. XVII.

The Quantity of fluid Matter separated in any Gland, is in compound Proportion of the Quantity of Blood, its Celerity at the Orifices of the excretory Vessels, the Wideness of the Orifices of these Vessels directly, and the Viscidity of the Blood reciprocally.

### *Demonstration.*

The Celerity of the Blood's Motion; the Wideness of the Orifices, and the Viscidity of the Blood, being given, the Quantity separated must be as the Quantity of Blood directly; for a greater Quantity separates more, and a less Quantity separates less.

The



## *Of Animal Secretion.*

The Quantity of Blood, its Viscidity, and the Wideness of the Orifices being given, the Quantity separated, will be, directly, as the Celerity; for a greater Celerity gives a greater Quantity, and a less Celerity, a less.

The Quantity of Blood, its Celerity and Viscidity being given, the Quantity separated will be directly as the Wideness of the Orifices; for the wider the Orifices, the more will be separated, and the straiter the less.

The Quantity and Celerity of the Blood, and the Wideness of the Orifices being given, the Quantity separated, will be reciprocally as the Viscidity of the Blood; for the greater the Viscidity, the less will be separated, and the less the Viscidity the more; therefore none of these being given, the Quantity separated will be as the Quantity of Blood, &c. Q. E. D.

**B**

**PROP.**

## Of Animal Secretion.

### PROP. XVIII.

An increased Quantity of Blood, increases the fluid Secretions, in a Proportion greater than the viscid.

#### *Demonstration.*

The Quantity of Blood being increased, the Diameter of all the Vessels will be enlarged, but in different Proportions; for the same Force being the increased Quantity of Blood applied to the less complicated Arteries, will distract them, or enlarge their Diameters more than it will the more complicated, being the Resistance in these is greater than in those, and that in Proportion to the Number of the Plications, one Artery hath more than another; now the Quantity of separated Matter being, *Ceteris paribus*, as the Wideness of the separating Canal, (*by the last Prop.*) the Quantity separated in the less complicated Artery, whose Diameter is more enlarged in this Case, will be greater than what is separated in a more complicated Artery, and seeing such Glands whose compounding Arteries are most complicated, discern

## Of Animal Secretion.

cern the most viscid Matter from the Blood, and the least complicated the most fluid (*by the 16th Prop.*): Therefore an increased Quantity of Blood, by increasing the Diameter of the less complicated Arteries, more than of the more complicated, increases the fluid Secretions more than the viscid, Q. E. D.

### PROP. XIX.

A decreased Quantity of Blood lessens the fluid Secretions more than the viscid; This needs no Proof, being the Reverse of the last Proposition.

### PROP. XX.

An increased Celerity of the Blood's Motion, increases the fluid Secretions more than the viscid, and *Vice Versa*. A decreased Celerity lessens the fluid Secretions more than the viscid.



## Of Animal Secretion.

### Demonstration.

The Celerity of the Blood's Motion being greater, the *Impetus*, by which the Arteries are diffracted, or their Diameters enlarged, will be greater, and so exert its Force more upon the less complicated Arteries, than upon such as are more complicated, and consequently promote the fluid more than the viscid Secretions, (for the Reasons given in the Demonstration of the 18th *Prop.*) and because an increased Celerity will, by breaking the Blood into small Parts, render it more fluxil, and thereby supply a greater Quantity of such Particles, as will pass the Glands, whose Diameters are the least; therefore, upon this Account also, an increased Celerity of the Blood's Motion, will increase the fluid Secretions more than the viscid, Q. E. D.

### P R O P. XXI.

An universal Inlargement of the Orifices of all the Glands, increases the fluid Secretions more than the viscid, and *Vice Versa*, an universal Contraction lessens

## *Of Animal Secretion.*

lessens the fluid Secretions more than the viscid.

### *Demonstration.*

The Diameters of the smallest Orifices being enlarged, are big enough to discern the viscid as well as the fluid Matter; and because the Matter discerned in different Glands, differ only in Degrees of *Cohesion* and *Fluidity* (by the 1st Corollary of the 13th Prop.) therefore the Orifices of the small Glands being enlarged, the more viscid Matter, that used to be separated in other Glands, will be separated in these; and therefore less will be separated in these Glands that are fitted for viscid Secretions, and more in those fitted for the Fluid. Therefore an universal Enlargement of the Orifices of all the Glands, increases fluid Secretions more than viscid, Q. E. D.

### P R O P. XXII.

An increased Viscidity of the Blood decreaseth the fluid Secretions more than the viscid, and *Vicé Versa*. An increased Fluidity increaseth the fluid Secretions more than the viscid.

B 3

*Demon-*

## Of Animal Secretion.

### Demonstration.

A decreased Celerity of the Blood's Motion lessens the fluid Secretions more than the viscid, (*by the 20th Prop.*) but the Celerity decreaseth as the Resistance increaseth; now the Resistance is greater when the Blood is most viscid, being it passeth with greatest Difficulty thro' the capillary Arteries; therefore an increased Viscidity, by lessening the Celerity, decreaseth the fluid Secretions more than the viscid. Q. E D.

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The

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## The Introduction.

**T**HAT I may treat more methodically of the Advantages to be reaped by a regular Use of the Non-Naturals, both with Respect to the Preservation of Health, and the Cure of Distempers, I shall explain some of the most obvious Phenomena in Diseases both Chronical and Acute, that it may appear, how well adapted they (the Non-Naturals) are, by a judicious Application, not only to confirm our Health, but restore it: And that, in many Cases, they will prove more efficacious than the most celebrated Drug. We have Instances more than enow of such as, by Change of Air, or a luxurious Diet for one more temperate, (which was Cornaro's Case) or flesh Meat for Milk and Vegetables; or of such, who have taken long Journies, or made long Voyages, or, by spontaneous Vomiting, Purging or Sweating, have been cured of such Distempers,



*pers, as would not yield to any Medicine, tho' never so generous.*

*The Method I shall pursue, will be, first, to account for some general Disorders in the Stomach; then to give a short History and Theory of three remarkable chronical Distempers, viz. the Asthma, Consumption, and Dropsy; and, after that, to explain some of the most notorious Symptoms in acute Distempers, especially in Fevers: With some short Hints towards establishing a better Method for the Cure of 'em, than what is followed by the Generality of Physicians.*

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A

# Mechanical Account

OF THE

## *Non-Naturals, &c.*

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### CHAP. I.

#### *Of the Stomach, and its Disorders.*

§ 1. **T**HIS well known that the *Stomach* is design'd and fitted for the Digestion of our Meat, by which it is divided into such small Parcels as will pass thro' the *Lacteals*, into the Mass of Blood, for our Strength and Nourishment. 'Tis made up of *Membranous* and *Muscular Fibres*, fill'd with Arteries, Veins, Nerves, and Glands, by which a *Viscid Matter* is

C                      sepa-

separated from the Blood, and pour'd into its Cavity, for very good Ends and Purposes.

§ 2. This, if increased, or diminish'd, either in its Quantity or Viscidity, gives rise to many Disorders in the Stomach, as Loss of *Appetite*, *Nausea's*, *Vomiting*, especially in the Morning, which is common to hard Drinkers, *Distention* of the *Stomach* after Eating, &c.

§ 3. The *Stomach*, by the help of its Muscular Fibres, together with the *Diaphragm* and *Muscles* of the *Abdomen*, is enabled so to *tofs* the Meat about, that if that Motion be not the sole, (according to the Learned (a) Dr. *Pitcarne*,) yet 'tis certainly the principal Cause of *Digestion*. The Force of the Muscles employ'd in this Business, is almost incredible; for if the comparative Force of the Muscles be as their *Solidities* or *Gravities*, as he hath demonstrated; and the Force of the *Flexor Policis* be equal to 3720 Pound weight, according to the Calculation of (b) *Borelli*; how great then must be the Force of all those

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(a) Dissertatio de Motu quo Cibi in ventriculo rediguntur ad formam sanguini reficiendo idoneam.

(b) De Motu Animalium, Par. 1. p. 126.



Muscles taken together? \* And indeed nothing else being necessary in the Business of *Digestion*, but that the Parts of our Food be so divided, that their greatest *Diameters* be less than the Orifices of the *Lacteals*; the Strength of these Muscles, seems more than sufficient for that Work. However, be this as it will, every Body will own that the Muscles have a considerable Share in it. Hence it follows, that whatever encreaseth or lesseneth Muscular Motion in general, or the Motion of the recited Muscles in particular, hastens or retards *Digestion*.

§ 4. An increased Quantity of Blood helps our *Digestion*; for Dr. *Cheyne* hath demonstrated in his third *Lemma* in the *New Theory of Fevers*, that *Ceteris paribus*, the Strengths of different Animals of the same Species, or of the same Animal at different Times, are in a triplicate Proportion of the Quantities of the Mass of their Blood. And the whole Strength of an Animal is the Force of all his Muscles taken together, therefore, whatever increaseth the

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\* It is, as the Doctor computes, equal to 260000 Pound Weight.

Strength, increaseth the Force of all the Muscles, and of these serving *Digestion*, as well as others. Yet notwithstanding the Truth of this Lemma, the Quantity of Blood may be encreased in such Circumstances, as to abate the Strength: The *Æquilibrium* between the Blood and Vessels being destroyed, wonderfully lessens the Strength, as it is evident from several Passages in *Baglivi de Fibra Motrice*. The sudden Suppression of Perspiration, tho' it increase the Quantity of the Blood, as it must considerably, by *Sanctorius's* Calculation, yet it lessens the Strength, because the retained Matter being what ought to be evacuated, so alters the Texture of the Blood, as to make it unfit for Muscular Motion. Suppose the increased Quantity be join'd with an increased Viscidity, the Quantity of small separable Parts decreasing, as the Viscidity encreaseth, the Quantity of *Animal Spirits* separated in the *Brain*, will be less, and the Tensity of the Fibres being in Proportion to the *Animal Spirits* forced into them, they will not be able to *Counterpoise* the greater Weight of the Blood, and so the Strength will be diminish'd.

§ 5. *Bellini*, in his forty-ninth Proposition *de Motu Cordis*, proves, That if the Blood be so Vitiated, as to increase or diminish Strength, 'tis the same as if the Blood was in a natural State, but its Quantity encreased or diminish'd in the same Proportion. So that the Blood when *Vitiated*, may so impair the Strength of the Muscles, as to spoil *Digestion*, and yet in some Case the Blood may be so *Vitiated* as to increase Strength according to the Proposition, and thereby help *Digestion*. Therefore a voracious Appetite and strong Digestion are no infallible Signs of a healthful State of the Blood.

We have one Reason from what hath been said, why nourishing Food in little Quantities, so often helps a weak *Digestion*; as also why *Hectic* People Digest their Victuals so very ill, the Quantity of their Blood being so much diminished as (c) Dr. *Cheyne* hath made out beyond Dispute.

§ 6. *Vomits*, *Bitters*, *Chalybeats*, and *Exercise*, especially in cool, dry Air, mightily promote *Digestion*, by strengthening the

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(c) *New Theory of Fevers*, p. 134.



Fibres, whereby Muscular Motion is increased, as well as by lessening the Quantity of viscid Matter, separated in the Glands of the Stomach; which *Vomits* do directly, and the other by increasing Perspiration, whereby other Evacuations are lessened, for (d) Dr. *Pitcarne* hath proved, that the increasing of one Evacuation, is the lessening of another.

*Bitters* and *Chalybeats* lessen the Viscidity of the Blood, and increase its Celerity, whereby it is better fitted for the Secretion of perspirable Matter, and also of *Animal Spirits*, which will strengthen the Muscular Fibres, and so help Muscular Motion, as appears by the twentieth Proposition of *Animal Secretion*.

How much *Exercise* in cool dry Air strengthens the Fibres, and encreaseth Health, is evident from the 7, 8, and 27 *Aporisms* of *Sanctorius*, § 3. compared with the 34 and 35 *Aphorism*, § 5.

§ 7. It is easy to shew in other Circumstances, how necessary it is to relax the Fibres of the *Stomach*, when by

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(d) *Dissertatio de Circulatione Sanguinis per vasa minima*, p. 33.

any Means they are grown too *Springy*. When the Fibres of the *Stomach* are too *Tense*, their *Vibrations* are smarter, and Sensation thereby more *acute*, so that what before was easy and delightful to the *Stomach*, is now most ungrateful and tormenting. In this Case there is often grievous Heat, Pain, Sicknes and Thirst, and yet the *Stomach* is not able to bear the smoothest Liquor without *Vomiting*.

Besides this, the Orifices of the Glands are contracted, and thereby the *Stomach* robb'd of a great Share of that Slime that should defend it; for the Quantity of Secerned Matter, is in a compounded Proportion of the Wideness of the Orifice, and Celerity of the Fluid, by the seventeenth Proposition of *Animal Secretion*: And farther, the Secerned Matter is not only less in Quantity, but also thinner, and the thinner the Fluid is, the fitter it will be to dissolve the *Acrid Salts* contained in the Blood, which by this Means will be better stocked with them, and consequently become a *Stimulus* itself, to so sensible a Membrane as the *Stomach* is lined with. The Smalness of the Secretory Vessels, is not the only Cause why this

Secerned Matter should be more Fluid, but also the increased Velocity, with which the Blood moves in these contracted Vessels. That the Blood moves more swiftly in the contracted Arteries is certain, (from the 3d *Corol.* of the 10th *Theorem* of Mr. Keil's *Lectiones Physicæ*) especially if the Contraction be Universal, as it will be by Consent, as is evident from *Bellini de Stimulis*, *Baglivi de Fibra Motice*, and also from several of (e) *Sanctorius's Aphorisms*.

How the Velocity of the Bloods Motion should increase the Fluidity of the Secerned Matter, seems more difficult to account for, since the Blood is so much disposed to deposit its Serum upon its slow Motion, as appears by Dr. *Lower's Experiment*, as also upon its Stagnation in a Porringer: But if we consider, that tho' the Serum be the most Fluid Part of the Blood, yet it is however liable to great Alterations as to its Fluidity, and is the most Fluid when moved with the greatest Celerity, this Objection will be of no Force. The specifick Gravity of Serum is to that of

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(e) *Med. Stat.* § 1. *Aphor.* 41, 50, 89, and 91.



Water, as six to five, according to Mr. Boyle's Observation, but yet this Proportion must be various, in different Subjects.

The increased Velocity in the contracted Arteries whose Vibrations for that Reason are quicker, must needs break and divide the Blood, whereby it becomes Fluid, and so fitter for more Fluid Secretions, and it will likewise so mix and jumble together, the yet remaining Viscid Parts, that they cannot in that Confusion separate from the other.

§ 8. The greater or less Quantity of *Saliva*, as (f) Dr. Cockburne hath proved, increases or lessens both *Appetite* and *Digestion*. And the same Author hath also shewn, how the greater Weight of the *Air* affects this Secretion.

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(f) *Oeconomia Animalis*, p. 15.

## CHAP. II.

Of the *Asthma*.

§ 1. **A**N *Asthma* is a Laborious and Difficult *Respiration*. It is divided into three Species, *Dyspnœa*, *Asthma*, and *Orthopnœa*.

1. A *Dyspnœa* is a dense and quick *Respiration*.

2. An *Asthma*, properly so call'd, is a frequent and strong *Respiration*, in which all the Muscles serving *Respiration*, are vehemently agitated. 'Tis join'd with a *Stertor* and *Wheezing*. Sometimes *Respiration* is strong and slow.

3. An *Orthopnœa* is the greatest Difficulty of Breathing, in which the Patient would be suffocated, if he did not sit upright. In all the three Sorts, *Inspiration* is more difficult than *Expiration*.

These three Distempers only differing in Degrees ; I shall Treat of 'em all under the common Term of *Asthma*.

§ 2. An *Asthma* being only a greater or less Difficulty of Breathing, whatsoever

ever then will interrupt Respiration, will cause an *Asthma*.

That Respiration may easily be perform'd, 1<sup>st</sup>, the Cavity of the *Thorax* must be enlarged, that the *Air* may enter the *Lungs*.

2. The *Air* must be *Heavy* and *Elastic*, without which Properties it wou'd not sufficiently blow up the *Vesiculæ* in the *Lungs*, to make room for the Passage of the Blood thro' 'em; and yet if the *Air* be either too *Heavy* or *Elastic*, it will stretch the *Vesiculæ* beyond their due Extent, and thereby obstruct the Passage of the Blood thro' the *Lungs*.

3. The Blood must be *Fluid*, and in fit Proportion to pass thro' the *Lungs*.

§ 3. In short then, whatever determines the Spirits in too great a Quantity, or too little into the *Muscles* serving *Respiration*, (*viz.* The *Intercostals*, both *internal* and *external*, the *Subclavius*, *Serratus Anticus major*, *Serratus Posticus superior*; or *triangularis*, *Serratus Posticus inferior*, *Sacrolumbaris*, and *Diaphragma*) by elevating the Breast too much, or too little, must hinder *Respiration*: Nay, if the *Lungs*, the *Aspera Arteria*, or the Membranes of the Breast, be either too lax, too dry, too much streightned by spasm.



spasmodick Contraction, or windy Inflation, stuff'd with a Viscid Slime, fill'd with *Tubercles*, or Stony Concretions, if there be either Matter, or Water collected in the Cavity of the *Breast*, or *Belly-Dropsies*, *Tumors* in the *Liver*, *Stomach*, *Spleen*, or *Mesentery*, in all these Cases *Asthmatick* Symptoms will ensue.

§ 4. If the Blood be either too much in *Quantity*, too quick in its *Motion*, too much *Rarified*, or too *Viscid*; it will upon all these Accounts pass more difficultly thro' the *Lungs*, and therefore require the *Lungs* to be more nicely *Inflated*, than will happen in such Circumstances, for which Reason the *Patient* will be *Asthmatick*.

§ 5. A Fit of the *Periodick Asthma*, which falls most under a *Physician's* Care, often happens once in a Fortnight (if cold bad Weather, or some Irregularity in Diet bring it not on sooner) and sometimes once a Month. I know a *Lady* who hath a Fit every Time her *Menfes* flow; and was rather worse than better for all the Medicines she had taken for seven Years, as she told me when first I visited her: Yet by a Medicine better suited to her Case, was mightily relieved.

relieved for almost two Years, and continues so yet, for ought I know to the contrary. The *Fit* is generally preceded by a *Flatulency*, and *Distention* of the *Stomach*; and invades the *Patient* about one or two of the Clock in the Morning, forces him, if violent, to rise out of Bed, and sit upright in a Chair: He finds a great straitness at his Breast, and strives by all means to draw a greater quantity of *Air* into his *Lungs*: His *Urine* is pale, and in great quantity; he can neither Cough, Sneeze, Spit, or Speak freely; the *Stomach* is now much more distended, and all heating Things increase it. The *Fit* is less after Vomiting, Purging, or Fasting: When it is violent the Heart *palpitates*, the Pulse intermits, the Face is almost black, and the *Patient* is subject to Swooning; when it begins to abate, he Spits plentifully, and not till then; sometimes a Crude, and sometimes a Concocted *Pblegm*; which he is not very much troubled with again till the next *Paroxysm*. His *Urine* is high Colour'd at the latter end of the *Fit*. All sudden Alterations of the Weather give a *Fit*.

Gill, Hyffop, Rue, Syrrup of Garlick, Syrrup of Sulphur, Tincture of Lavender, Spirit of Hartshorn, Myrrh, Saffron, Balm of *Gilead*, Balsam of *Peru*, Bal. Sulphur, Anifat, Succinat, Terebinthinat, Tincture of Sulphur, with Syrup of Ground-Ivy, Lime-Water, Infusions of Millipides, Hore-Hound *lb. ss.* to six Gallons of Beer, Vomits, Bleeding and Purging, all these prov'd unsuccessful in the Intervals, (g) as a very good Judge in this Case informs us.

A full Diet, and especially Debauches, render the *Fit* more severe; a dry Air best agrees with the *Asthmatick*: He is free from his *Fits* in Frosty Weather, if it be not too severe. Rain when it falls does not much affect him, but the preceding Vapours do; damp Houses, fenny Grounds, high Winds, and Storms, mightily offend him: Any kind of Smoak is offensive, but the Smoak of Wood the most, and that of *Dutch Turf* the least. In Summer the *Fits* are both more frequent, and severe than in Winter. A *Fit* is generally increas'd by the *Heat* of the Fire, or Bed, and eased by

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(g) Sir John Floyer's *Treatise of an Asthma*, p. 18. and 19.



opening the Window. All strong Liquors are prejudicial, especially in the *Fit*; new Drink of all Kinds is improper.

All Sorts of Viscid, Mucilaginous, and Windy Victuals are prejudicial; Meat that swells least in the Stomach, is best for the Asthmatick.

*Etmuller, Waldschmidt and Baglivi*, commend Vomits, *Laudan. cum Ther. Androm. Millepedes, Terebinthinats, Balsam Peru, Sperma Ceti, Anti-hystericks, Anti-epilepticks*, and Solutions of Gum *Amoniacum*, &c.

Sir John Floyer hath try'd most of the celebrated Medicines, commended by any of our *Modern Authors* without any Advantage, but found Benefit by using the Prescriptions of the *Ancients*, *(b)* and indeed they are much more agreeable to the *Theory* of this Distemper; and they who expect to be successful in the Cure of it, must vary their Method according to the various Causes that produce it, which the foregoing *Theory* will give some Light into.

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*(b)* Vide Nicol. Myreps. de Antidotis, § 1. cap. cxxxv. Orabasi, lib. ix. and cap. v. & Aetii Tetrab. lib. 11. Sermon. iv. cap. lvii.

## C H A P. III.

## Of a Consumption.

§ 1. **A** *Phthisis* is a Consumption of the *Muscular* Flesh, either with, or without, a *Fever*. 'Tis either *Original* or *Symptomatical*. The *Original* is either *Nervous*, which is call'd an *Atrophy*, or *Pulmonary*: It is the last I shall only take Notice of in this Place. I shall first observe, what preceeds a *Pulmonary* Consumption: Secondly, recite the Concomitants of it; and in the next Place take Notice of its Consequents, in Order to explain some of the most obvious *Symptoms* that attend it.

§ 2. The *Antecedents* of this Distemper are a Suppression of some natural, or preternatural Evacuation, without Correcting the Cause on which it depended, grievous Passions of the Mind; drinking too plentifully of Spirituous Liquors; an idle Course of Life, Night Studies; fenny, heavy, and smoaky *Air*; an hereditary Disposition; Crookedness, strait

*Of a Consumption.* 49

strait Breasts, any thing let fall upon the Lungs, Distempers ill Cur'd, and especially catching Cold in these Circumstances.

The Concomitants are,

1st. A *Cough*, which is thus distinguish'd from a *Catarrh*; 'tis owing to *Tubercles*, or some other Indisposition in the *Lungs*, with a Sense of Weight in the Breast, and Difficulty of Breathing, and in the Beginning 'tis dry, tho' in the Progress of the Distemper, it be moist.

A *Catarrh* is moist in the Beginning, and terminates in a few Weeks, yet is troublesome and almost continual; whereas a Consumptive Cough is mild in the Beginning, and returns by Intervals; the Patient is Thirsty, his Tongue foul, and loses his Appetite, and coughs after Meat till he vomit it up: The Voice is hoarse, or squeaking, the Weight is greater in one Part of the Breast than the other, and he coughs more, lying on one Side, than on the other.

2. There is a Fever, Loss of Appetite, Thirst, reddish Urine, quick Pulse, red Cheeks, especially after Meat, Heat of

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the Palms of the Hands, Soles of the Feet, and the *Hypochondres*.

3. Loss of the Muscular Flesh.

The Consequences of the beginning Consumption I have been describing, which, if not cured, becomes a confirm'd one, which is attended with a new *Fever* of the *Inflammatory* kind, as *Pleurisie*, or *Peripneumony*, and afterward with a *Putrid*, and *Intermitting Fever*, and then the *Cough* increases, and vast Quantities of Matter is expectorated, sometimes sweet, and sometimes fætid, with Night Sweats, *Diarrhœa's*, swell'd Legs, sore Mouths, Pain in the Throat upon swallowing any thing, and at last the *Facies Hippocratica*, which terminates in Death.

§ 3. When any Evacuation is suppressed, whether it be the *Menses*, the *Hemorrhoids*, *Urine*, or the Matter of *insensible Perspiration*, &c. 'twill necessarily induce a *Plethora*, which if it cause not a Fever, as it often doth, will, by its greater Weight upon the Vessels it circulates through, so relax 'em, as to render them less fit to carry on the Circulation; upon which account the Blood will not only pass through the Capillary Arteries more difficultly, but be apt to

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to deposit a *Slimy Mucus* upon any part that is disposed to receive it. This greater Quantity of Blood, by distending the *Arteries* of the *Brain*, will in some Measure intercept the Motion of the Spirits through the Nerves, and the greater Viscidity of the Blood, together with its diminished Celerity, will lessen the Quantity of Spirits separated in the Brain. (by the 20th and 22d Propositions of *Animal Secretion*) therefore the force of all the *Muscles* in the Body, and consequently of these serving *Respiration*, will be lessened. Now that this greater quantity of Blood, which is also more Viscid, may pass with Ease thro' the *Lungs*, 'tis necessary that the *Lungs* shou'd be more Inflated, than at another Time: But, on the contrary, in the present Circumstances, they will be less; for their Inflation depending on the Quantity of *Air* admitted into 'em, and that Quantity depending on the greater or less Enlargement of the Cavity of the *Thorax*, and this upon the Force of the *Muscles* serving *Inspiration*, which is prov'd to be less in this Case; therefore the Blood will be apt either to stagnate in the *Lungs*, and so cause *Inflammations* which may end in *Ulcers*, or leave

behind it a slimy Matter, which will cause *Tubercles* in the *Lungs*, whereby the *Patient* will be inclined to cough, but not violently, because the *Tubercles* are not very troublesome, and there will be a Sense of Weight in the Breast, and a Difficulty of Breathing, especially upon quick Motion; for the same Reason, the Irritation to cough will be greater, and the Difficulty of Breathing increased, by any Thing that lessens the Cavity of the Breast, as a full Stomach will do, by hindering the *Diaphragm* from sinking in *Inspiration*; therefore upon *Eating*, the Patient coughs till he vomit, and so eases himself of the Burthen.

§ 4. If the *Tubercles* be only on one Side of the *Lungs*, the Weight is perceiv'd there, and the Patient coughs more for lying on one Side than the other: The Blood being in this viscid State, its Motion impair'd, and the Coats of the *Glands* relax'd, will increase the Quantity of viscid Secretions above the Fluid, and also the Viscidity of the secern'd Matter, (by the 15th, 20th and 22d Propositions of Secretion) therefore the *Glands* of the *Stomach*, the *Asperia Arteria*, and those which empty their Contents into the Mouth, will



will separate a Matter more *viscid* than ordinary, and also in greater Quantity; from whence we may account for the Loss of Appetite, Thirst, and Foulness of the Tongue, and Hoarseness we observe in this Distemper; the Viscidity of the Blood increasing, and the Quantity of *Animal Spirits* decreasing, the Orifices of the *Glands* will be mightily enlarg'd, and so a *Hectic Fever* will ensue, (by Dr. Cheyne's Theory of that Distemper) and consequently, the *Patient* will be thirsty, lose his Appetite, make reddish Urine, have a quick Pulse, red Cheeks after Meat, Heat of the Palms of the Hands, Soles of the Feet, and *Hypochondres*, with a Loss of the muscular Flesh.

§. 5. Now if the *Patient*, in these Circumstances, be left to the Tyranny of this Distemper, without any *medical Assistance*, or be treated after such a Manner, as to increase the Cause of his Distemper, (as he generally is, with *Pectorals* and *Balsamics*, which is the Reason so few are recover'd from this Disease;) the Symptoms taken Notice of in the last *Stadium*, or in a confirm'd Consumption, will immediately succeed: As a *new Fever* of the *inflammatory Kind*, &c. for the *Laxity* of the solid Parts

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increasing, as also the Viscidity of all the circulating Liquors, the *Tubercula* in the *Lungs* will grow larger every Day than other; the Heat also increasing, will dispose these *Tubercula* to inflame, and suppurate, which will occasion *Pleurisies*, *Inflammation* of the *Lungs*, and at last *putrid* and *intermitting Fevers*, when the *Imposthumation* breaks. From this *Ulcer* in the *Lungs* will great Quantities of either sweet or fætid Matter be expectorated by Coughing, and the Viscidity of the Blood being greater, and the Coats of the *Glands* being also more relaxed, a greater Quantity of concocted *Phlegm* will be separated (in those *Glands*, which empty their Contents into the Mouth,) either by *Hawking* or *Coughing* (by the foremention'd Propositions of Secretion,) so that the Cough will grow worse, and the *Patient* will spit more: And he will also be troubled with Night Sweats; for the Pores of the Skin being mightily enlarg'd, and more so in Sleep, than when waking, and the Blood's Motion being accelerated by the Heat of the Bed, upon both these Accounts, Sweat will be forc'd; and if, by any Means, this Evacuation be suppress'd, some other will be increas'd,

increas'd, which is generally that by the *Glands* of the *Intestines*, they being so much relax'd, and their Orifices so much enlarg'd, for which Reason a *Diarrhœa*, and *Night Sweats*, do alternately waste the Patient's Strength; but if both these Evacuations be suppress'd, the detain'd Matter will fall upon these Parts, where its Motion is slowest, and the Resistance to its Pressure is the least; now the *Legs* being at the greatest Distance, both from the Heart, and Brain, and in the Day-time in a depending Posture, the Motion of the Blood will be there the slowest, and the Tensity of the Fibres the weakest: Whereas a sufficient Degree of *Tensity* is requir'd to resist the distending Force of the circulating *Humors*; therefore the *Legs* will swell, when these Evacuations are suppress'd. The Coats of the *Glands* being yet more relax'd, will not be able to press out their Contents, whereby *Tumors*, and sometimes slight *Ulcerations* will succeed, so that the Mouth will be fore, and the Throat pain'd upon Swallowing.

§ 6. I've now, as briefly as I cou'd, accounted for the Production of a *Consumption*, by the Suppression of some



## 56 Of a Consumption.

natural Evacuation, and could as easily shew how 'tis brought about by the rest of the *Procatartick* Causes assign'd; but this wou'd run me quite beyond my Design, and perhaps I may find a fitter Opportunity of doing it, being furnish'd with a good *Stock* of *Observations* of Cures perform'd in this Distemper, by a Method and Medicines vastly different from what is commonly practis'd and prescrib'd.

§ 7. I shall only now examine, how well the present Practice, by *Pectorals* and *Balsamics*, answer the Indications taken from the preceding *Theory*: The Indications are principally to render the *Humors* more fluid, the *Fibres* more tense, and to evacuate the viscid *Phlegm*, with which the *Glands* of the Stomach, and those about the Mouth, are stuff'd, lest by a longer Stay the Glands be still further relax'd.

The common *Dispensatory Pectorals* are the *Decoct. Pectorale*, *Syr. Botryos, Capil. Veneris, Glyceriz. Hysop, Scabiosæ, Mel & Oximel Scilliticum, Succus Glycerizæ, Loboc de Caulibus, Farfar, Papaveræ, Passul. Pino, Portulac. Sanans, Diacod. Spec. Diatragacant. Frigid. Pulv. Haly*; and the most famous Simples are Sugar, Honey and  
Liquo-

*Liquorice.* Now all these, except the *Mel. Oximel Scillit.* and *Syr. Scabiosæ* (which are all Vomits) are *sweet, slimy Mucilages*, and are therefore directly contrary to the *Indications* in this *Distemper*; for they will both *Relax* the *Solid* Parts, and thicken the *Fluid*, they will fill the *Stomach* with a glutinous Slime, which will mightily *pall* the *Appetite* and weaken *Digestion*, and they will also increase the Thirst: Whereas the *Medicines* proper in this Case, shou'd *contract* the *Solid* Parts, *attenuate* the *Fluid*, and *evacuate* at due Intervals, the *viscid Matter* lodg'd in the *Glands*; therefore gentle *Emetics*, mild *Stomatics*, moderate *Exercise*, especially by *Riding*, according to Dr. Sydenham's Observation, a clear dry *Air*, the Use of the *Cold Bath*, provided the Patient stay but a little Time in at once, and the *Distemper* not far advanc'd, *Blistring Plaisters* frequently apply'd, with a Diet of *easy Digestion*, will best answer our Expectation in the *Cure* of a Beginning *Consumption*: But when the Disease is arriv'd at its last *Stadium*, nothing but Death is to be expected: The best that a *Physician* can do in this Case, is only to mitigate the Symptoms in Order to make the Remains  
of

of Life more comfortable. Yet 'tis not easy even in this *Stadium* of the Distemper to make certain and infallible *Prognostics*: I've more than once been deceiv'd in the Recovery of a Patient, whose Symptoms gave not the least Encouragement to expect it. The first Case was of a *Baker*, (and *Bakers* according to (g) *Ramazini's* Observation, are subject to this Distemper, which Thing I've also myself observ'd) who had been troubled with a *Cough* for above Twelve Months, which gradually increased, till he was in the following Condition. When I first visited him, his Stomach was lost, his Thirst very great, his *Urine* red, and let fall a *Laceritious* Sediment, his Tongue foul, Sweat prodigiously every Night, Cough'd almost continually, and expectorated vast Quantities of concocted *Pus* with Streaks of Blood in it, which often smell'd abominably: His Flesh was gone, and by Reason of Weakness was scarce able to rise from his Bed: In this deplorable Condition, at his earnest Desire, I ordered such Things as I thought most fit

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(g) De Morbis Artificum, p. 184.



to mitigate the Symptoms, without giving him the least Hopes of a Recovery; but contrary to my Expectations, the next Time I saw him, which was about a Week after, he was much better, and by a strict Observance of Directions, in a Month's Time was fit for Drinking the *Chalybeat Waters*, which I order'd him, and thereupon he recover'd without Relapse. The Medicines that recover'd him were such as were indicated by the foregoing *Theory*. And as for *Balsamics*, they are useful in this Distemper, in as much as they are *Stomachics*, or *Diuretics*, in which Virtues they may easily be improv'd by *Acid* or *Saline* Mixtures; for by themselves, if taken in considerable Quantities, they generally both *pall* the Stomach, and *heat* the Blood, and so rather promote than abate the *Symptoms* of this Distemper: But for the Ends for which they are usually prescrib'd, they are altogether improper; for were they immediately apply'd to the ulcerated Part, they wou'd be of little Advantage; for the same Reason they are discarded the Practice of *Chyrurgery*, by the most Skillful in that Art: But so far are they from being immediately apply'd to the Part affected, that but little of them enter the

the Mass of Blood, and that very much alter'd from what they were when taken in at the Mouth. All *Balsams* whatsoever are much more *Viscid* than the Matter separated in any of the *Glands*, and the *Viscid*ity of the separated Matter being as the Number of *Plications* in the complicated Artery (*by the 2d Corol. of the 9th Proposition of Secretion*) therefore to separate a Liquor more *Viscid*, than what is separated in any other of the *Glands*, as *Balsams* are, the *Intestines*, which answer to the Artery, ought to be more complicated, than any Artery of which a Gland is compos'd; whereas the *Testiculus Humanus* is 50 Times more complicated than the *Intestines*; for the *Plications* of the *Intestines* are not above 96, as (k) Dr. *Cheyne* hath observ'd; and those of the *Testiculus Humanus* are 4800, for (l) *Belini* tells us, the Length of the complicated Artery of the *Testiculus Humanus* is 300 Ells, and the Altitude  $\frac{1}{6}$  Ell; therefore the Number of *Plications* must be 4800. Now as 96. 4800. 1. 50. therefore if *Balsams* were only of equal *Vis-*

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(k) *New Theory of Fevers*, p. 50.

(l) *De motu Cordis*, Pro. 40.

city with the Matter separated in the *Testicles*, the *Guts* in Order to separate them into the *Lacteals*, must be either 50 Times longer, that they might be 50 Times more complicated, or the *Balsams* must be made 50 Times more Fluid, and hereby lose all the Properties of *Balsam*. So that *Balsamics*, as such, can never come at the Part affected, and therefore never heal it.

Some will be apt to imagine from what I've said, that I assign too small Diameters to those Particles of *Chyle* which enter the *Lacteals*, whereas they are no smaller than what's necessary for the Preservation of our Lives and Healths; for was any Particle of indissoluble solid Matter, such as *Stones*, or *Minerals* (both which are us'd in Medicine) to enter the *Lacteals*, and if the Diameter of such Particles was greater than the Diameter of the smallest Vessels in a Humane Body, they would obstruct 'em, and cause *Inflammations*, *Gangrenes*, and *Death* at last. Now *Leeuwenhoek*, with his *Microscopes*, hath discovered Vessels in a Humane Body, whose Diameters are 79200 Times less than an Inch, and so small at least ought the Diameters of the *Lacteals* to be.

Cor.



## 62      *Of a Consumption.*

*Cor.* 1. Hence we may see how necessary 'tis, that all hard, solid Medicines, (such as *Steel* and *Testaceous Powders*) shou'd be finely Levigated, if we expect any Advantage from them in the Blood.

*Cor.* 2. That these Medicines, as they are commonly prepar'd, only exert their Force in the *Primæ Viæ*, and are of no Use to correct the suppos'd *Luxuriant Acids* in the Blood.

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C H A P.

## CHAP. IV.

## Of a Dropsy.

**A** Dropsy is a watry Swelling, either of the whole Body, or Part of it. 'Tis divided into two Species, viz. the *Anasæara* and *Ascites*. In the first, the Tumor is most in the Legs, and receives the Impression of the Finger, but the *Pit* remains not so long as in a *Leucophlegmacy*: The *Urine* is sometimes pale and plentiful, the Patient hath no Thirst, tho' he lose his Appetite. In the *Ascites* the Tumor is in the Legs, Thighs, Belly, and *Scrotum*, the *Water* is forc'd sometimes into the Cavity of the *Abdomen*, and at other Times into Vessels it forms itself, either from some dilated Membrane, or obstructed *Lympheduct*: The *Water* is of various Colours; 'tis Salt, *Lixivious*, a little Corrosive, and Frothy, when mix'd with common *Water*: The *Urine* is red, lets fall a red Sediment, and little in Quantity: The *Thirst* is excessive, and the *Appetite* very little.

The

The *Antecedent* Causes are much the same with those of a *Consumption*, excepting such, as more especially respect the *Lungs*, which is the Reason that determines the preceeding Disorder to a *Consumption*, rather than a *Dropsy*; for whatever preceeds either a *Consumption*, or *Dropsy*, disposes the Humors to be viscid, and the Fibres lax: The Laxity of the Fibres in a *Dropsy*, is both greater and more universal than in a *Consumption*, and the Motion of the Blood so slow, that *Perspiration* is almost intirely suppress'd, so that a Load of *Serum* will be thrown on such Parts as are fittest to receive it: And these are such as are *depending* and most lax, such as the *Legs*, *Thighs*, and *Viscera*. The *Ascites* seldom happens without some Fault in the *Kidnies*, or a preceeding *Jaundice*, Tumor in the *Liver*, or some other of the *Viscera*, whereby the *Lymphatick Vessels* are either mightily distended or broken: But the *Jaundice* and these Tumors may easily be produc'd by lax Fibres, and viscid Blood. (m) *Doleus* and (n) Dr. *Leigh* have both observed the *Omentum*

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(m) *Encyclopedia Medicinæ*, &c. p. 364.

(n) *Exercitatio de Hydrope*.



in Dropsies either full of Tumors, or else putrify'd; and 'tis from this Observation, among some others, that *Doleus* supposes a Passage from the *Stomach* to the *Bladder*: But these *Tumors* may as well be the Effect, as Cause of the Distemper; for even the *Jaundice*, Tumors in the *Liver*, *Spleen*, *Pancreas*, *Mesentery*, *Omentum*, &c. may (by such a State of the Solids, and Fluids, as I've assign'd) be produc'd, as I have observ'd before. As the Viscidity of the Blood daily increases in *Consumptions*, for the Reason assign'd in the preceding Chapter; so, in this Case, the Blood grows every Day more watry; for the Laxity of the Fibres being so very great, and the Motion of the Blood so slow, the complicated Arteries, of which the Glands are compos'd, cannot be sufficiently *distracted*, and therefore will separate very little from the Mass of Blood; so that the Quantity of *Serum* will continually increase, and the Motion of the Blood being so slow, the fibrous Parts will retire into the Middle of the Canals in which it moves, even as it doth, when taken into a Porringer, and force the *Serum* against the Sides of the Vessels, till the Pressure become such,

as to drive the *Serum* thro' the Pores of the Vessels, and lodge it in their *Interstices*: Or else so dilate some of 'em, as to form *Vesicles* to contain it.

From these short Hints I've given about this Distemper, 'tis evident, that the Cure of a beginning *Dropsie*, is to be attempted by such Means as strengthen the *relax'd Fibres*; render the Humors more fluid; increase the Celerity of the Blood's Motion, and promote some, or all the *Secretions*, of which that of *Urine* and *Perspiration* are the best adapted to answer our Expectation: But in most *Hydropic* Cases, 'tis very difficult to increase any of the *Secretions*, and especially that of *Urine*. When the *Prima Viæ* are obstructed, *Urine* is better promoted by gentle *Purges* than *Diuretics*, and I have found, that Preparations of *Tartar* best answer this End; and that when the *Stomach* and *Guts* are well cleansed, an *Infusion* of *green Tea*, in *Rhenish Wine*, is not only a good *Diuretic* and *Stomachic*, but increases the Celerity of the Blood's Motion, and at the same time abates the Thirst, whereas all other *Bitters* I've yet try'd, increase it.

*Dry Food*, *Diuretics*, *Diet-Drinks*, *Exercise*, tho' never so violent, provided it  
weary

weary not the Patient too much, a *dry Air*, the *Cold Bath*, and *Pleasant Company*, are of a greater Necessity in the Cure of this Distemper, than any Sort of Medicines without 'em.

Dr. Willis tells us of some cured of an *Anasacra*, only by removing their Habitation from a foggy to a dry Air; and I question not, but that several Distempers may be as *safely* and *pleasantly*, tho' not so speedily cured, by a regular Use of the *Non Naturals*, as by any Means whatsoever.



CHAP. V.

Of Acute Distempers, and in particular of a Fever.

§ 1. **A**cute Distempers, whether they be Fevers, Pleurifies, Rheumatisms, Cholicks, &c. especially those attended with Pain, generally proceed either from a too great Contraction of the solid Parts, too violent Motion in the fluid Parts, or both these together.

§ 2. Dr. Cheyne, in his *New Theory of Fevers*, hath prov'd at large, that the general Cause of *Acute Fevers* is an *Obstruction*, or *Contraction* of the *Glands*, whereby the Quantity of Blood, and *Liquidum Nervorum*, is increas'd ; from whence all the Symptoms of *Fevers* may be accounted for.

§ 3. If the *Pain* be great, especially in *membranous* Parts, it will either cause or increase a *Fever*, for it is always attended with a *Contraction* of the pained Part, (as is evident from the  
(o) Bel-

*and particularly of a Fever. 69*

(o) *Bellinian Doctrine de Stimulis*) and by this *Contraction*, the Motion of the Blood and Spirits is either totally obstructed or retarded, and the Part swelled, and by their Pressure against the Sides of the containing Vessel, more forcibly, as they will, when their direct Motion is hinder'd, the Pain is both increased, and propagated further, and the *Contraction* is more or less communicated to all the Parts of the Body, whereby *Secretions* are stopped, and the Quantity of Blood increased, which will either cause or increase a *Fever*. Besides Pain, which is a *Stimulus*, makes more dense and strong Vibrations of the solid Parts, and so divides the Blood into smaller Parts, which must therefore take up more Room; for the *Surfaces* of Bodies, upon their Division, do not decrease so fast as their *Solidities*, these being in a *triplicate*, as those are in a *duplicate Proportion*, to their *Diameters*: So that the more Bodies are divided, the more sensible Space they fill; and this is all one, as if the Magnitude of the Particles had continued the same, and the Quantity been increased, see-

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(o) *Bel. de Urin. & Pulsibus, p. 165.*

70      *Of Acute Distempers,*

ing all the Effects of an increased Quantity are hereby produced.

§ 4. This greater *Fluxility* of the Blood will supply a greater Quantity of *Animal Spirits*, as is known to any who understand the Nature of *Secretion*, and being that a *Fever is but the increased Circulation of the Blood*, and the *Velocity* of the Blood's Motion being in compound Proportion of the frequency and Strength of the Heart's Contraction directly, and the *Resistance* it meets with reciprocally, and these, depending upon the quantity of *Animal Spirits*, serving for the Contraction of the Heart; and the *Resistance* being less, from the greater *Fluxility* of the Blood, therefore the greater *Fluxility* of the Blood will cause, or increase a *Fever*.

§ 5. I shall now shew, how the most obvious *Symptoms* of a *Fever* are accounted for, from the too great *Velocity* of the Blood.

§ 6. The Pulse in a *Fever* is strong, or quick, or both; the Patient is hot, and dry and restless, he is thirsty, his Tongue is foul or dry, he is watchful, then deliræous, convulsed, and the Pulse is now weak and intermitting, and then the Patient falls into cold Sweats, and dies.

§ 7. The



*and particularly of a Fever. 71*

§ 7. The Blood cannot move more swiftly thro' the Arteries, unless the Heart contract more frequently, more strongly, or both; now the Dilatation of the Arteries, or the *Pulse*, keeps Time with the Contraction of the Heart, and is more or less *dilated*, as the Heart is more or less *contracted*; therefore, if the Celerity of the Blood be greater, the Pulse must be *quicker*, or *stronger*, or both.

§ 8. The Blood moving more swiftly, every Part of the Body will receive a greater Share of it, in the same Space of Time, than it would have done, had it mov'd more slowly: The Blood being always hot, (be it from what Cause soever it will) therefore every Part of the Body receiving a greater Quantity of Blood, will be sensible of a greater Heat. And this Proposition may so easily be demonstrated, that I shall not stay upon it, *viz. That (Cæteris paribus) the Heat of an Animal is in compound Proportion of his Quantity of Blood, and the Celerity of its Motion.* There may several other Things contribute to the greater Heat of the Patient; but this is certain, and evident from an increased Celerity.

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§ 9. This great Heat will make him both *dry*, by evaporating the thin Parts, and *restless*, or, which is all one, to change his Posture frequently, in Order to ease himself of the Torment he endures.

§ 10. This Heat will also act as an universal *Stimulus*, whereby all the Glands will be straitened, and, consequently, the secern'd Matter will be thinner, or more fluid, and the remaining Part of the Blood more solid, than in a natural State; therefore he will be *dry*, as well as *hot*.

§ 11. The gross Parts of the Blood being retained in this Condition, it is therefore more viscid; besides, its Viscidity is increas'd by its Heat, as is known by Experiment; for if you apply a much less Degree of Heat, than will boil Water, it will turn the *Serum* into *Jelly*. The Heat of the Blood is greater in *Fevers*, than most imagine. The Heat of a Man's Skin, whose Pulse beats sixty Strokes in a Minute, is to the Heat of boiling Water, as 16 to 52, as appears by the *Thermometer*; so that boiling Water is but little more, than three Times as hot as the Blood of a healthy Man. Now, if the Heat of the Blood should  
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*and particularly of a Fever.* 73

increase in Proportion to the Frequency of the Pulse, (as it must, if the Pulse beat with the Strength it did, and generally it is stronger;) a Man then, whose Pulse beats 195 Strokes in a Minute, would be as hot as boiling Water; and it is common for a *Feverish* Pulse to beat 120 Strokes in a Minute. Hence we may account for the *Syzyness* of the Blood in *Pleurisies*, and other *Inflammatory Distempers*, and so be rescued from the dangerous Practice of those, who, because they observe themselves, or have been told by others, that *Volatile Salts*, and *Spirits*, such as *Hartsborn*, *Sal Armoniac*, &c. will dissolve the *Serum*, when coagulated by an *Acid*; therefore prescribe these hot, stimulating Medicines, to the imminent Hazard, if not Destruction, of their Patients. And this they do, from a mistaken *Hypothesis*, that the *Syzyness* of the Blood, is owing to a *Coagulating Acid*. The contrary to which Dr. *Pitcarne* hath proved in one of his *Dissertations*. (p)

§ 12. The Blood will then be made viscid upon several Accounts; and from

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(p) *Dissertatio de Opera quam prestant, Corpora,*  
Etc.



## 74      *Of Acute Distempers,*

this viscid Blood will be separated a less Quantity of *Saliva*, and that more slimy than in a natural State; the Quantity of secreted Matter being in a reciprocal Proportion to the Viscidity of the Blood, by the 17th Proposition about *Animal Secretion*: And also, because the greatest Quantity of *Saliva* is separated, when the Blood moves the most slowly, as appears by making a Ligature upon the *Jugulars*. Hence both the Foulness and Dryness of the Tongue.

§ 13. The Orifices of the Glands being straitned, by the stimulating Heat, the Quantity of *Saliva* will still be less; and the Heat speedily evaporating the most fluid Part of it, the whole Mouth must be exceeding dry; whence proceeds that unquenchable Thirst, Persons complain of in *Fevers*.

§ 14. This greater Velocity of the Blood, will send a greater Quantity into the Brain, in a given Time; and an increased Velocity increaseth the fluid Secretions more than the Viscid, by the 20th Proposition of Secretion. The *Animal Spirits* being the finest of any secreted Matter, the *Exility* of their Parts rendring them invisable. Therefore

*and particularly of a Fever.* 75

fore, upon both Accounts, an increased Velocity of the Blood will increase the Quantity of *Animal Spirits*. Their Quantity being greater, the *Nervous Tubes*, and all the Motory Fibres, will be fuller, and more *tense*, whereby *Sensation* will be stronger. Now since it is a necessary Requisite in *Sleep*, that the Fibres should be *relax'd*, and the *Animal* void of Sensation, and being neither of these can happen when the *Animal Spirits* are separated in greater Quantity, as they will be, when the Blood moves more swiftly; therefore the greater Velocity of the Blood will prevent Sleep, or the Patient will be watchful.

§ 15. And he will be also *delirious*; for the Nerves being fuller of Liquor, its *Undulations* will be more *dense* and *quick*, Sensation will be more lively, and less Impulses upon the Extremity of the Nerves will cause it. And the more lively any Impression is, the greater Attention the *Soul* bestows upon it: Whether it be attended with Pain, or Pleasure; and so more regardless of former *Ideas*, being intirely imploy'd about the present Sensation. Now observe a Person in this Condition, whose Senses  
are

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are so quick, that the most trivial Object will affect him. Suppose him so intent upon the present Objects, as to mind nothing else, and to speak of what he observes, just as *Ideas* come into his Mind, without exercising his Judgment, in comparing them with former *Ideas* laid up in his Memory, his Talk must needs be incoherent, or in other Words, you will say, he is *delirious*.

Besides this, the Blood having acquired a greater Solidity, by the Evaporation of its thin Parts, and its Celerity being so much increased, the Strokes upon the Extremity of the Nerves will be so much stronger, whereby the *Reflux* of the *Nervous Fluid* to the Brain, will be as quick, as if the Motion of the Blood was slower, and the Nerves were struck upon by *Effluvia* from external Objects; so that the same *Ideas* will be excited, as if those Objects were really present; and the Actions of Men being always suitable to the *Ideas* they have, there will be such Actions as are produc'd by external Objects, when none such are present; such as those consequent upon Joy, Fear, Anger, Revenge, &c. In this Case, the By-standers will con-



*and particularly of a Fever. 77*

conclude they act irrationally, or are *delirious*.

§ 16. *Convulsions* are nothing but the *involuntary* Contraction of the Muscles: The Muscles are contracted by an *Ebullition* of the Arterial Blood, and Animal Spirits: The Animal Spirits are derived into the Muscles, by the Command of the *Will*, or by shaking of the Nervous *Tubes*, through which they are convey'd. How the Nerves may be shaken, and that irregularly too, in the supposed Circumstances, is evident from the last Sect: But *Convulsions* from this Cause are generally strong, and happen not so often as the other I am about to account for, which is called *Twitching*, or a *Subsultus Tendinum*; and they are caused after this Manner.

The Celerity of the Blood's Motion, and its Heat continuing, must at length render it so viscid, that few, or none, of the Particles are small enough to enter into the narrow Orifices of the Nerves; the Supply of Spirits being hereby cut off, their Quantity will continually decrease, till it be so small as not to keep the *Antagonist* Muscles equally contracted. The Entrance of more Spirits into that Muscle is not only prevented

## 78 *Of Acute Distempers,*

vented, but the Spirits remaining in that Nerve, which terminated in the contracted Muscle, are forced back, into that Place where there is the least Resistance; and that is the *Antagonist* Muscle, being now relaxed, whereby that Muscle is contracted, and the other relax'd, and so alternately; and since the Quantity of Spirits is so small, the Contraction of the Muscles will be very weak, and the convulsive Motion will be a sort of *Trembling*, or *Twitching*.

The Influx also of the Spirits into the Nerves, by the Pulsation of the Arteries being alternate, so would their Efflux thro' the Emissary into the Muscles, were it not for the Fulness of the Nerves, whereby the Efflux becomes continual; therefore when the Nerves are much emptied, the Efflux will be sensibly alternate; whereby the Muscle will be alternately contracted, or there will be *Twitchings* of the *Tendons*.

§ 17. The Patient, in this Condition, hath a weak and interrupted Pulse, and in a cold Sweat.

The Pulse is weak, by the Defect of Spirits to contract the Heart, and because the Blood grows still more viscid,  
by

*and particularly of a Fever. 79*

by losing its Serum in Sweat, its Motion through the Arteries must be slower; whereby the Resistance to the Contraction of the Heart will be greater. Therefore a greater Quantity of Spirits must be derived into the Heart, to overcome this greater Resistance; and so a longer Time must be spent before the Heart be contracted, or the Interval, between the two Pulsations of the Artery, will be greater: But the Resistance being overcome, and the Contraction of the Heart being stronger, caused by a greater Quantity of Spirits derived into the Heart, in a longer Time, the Contraction will be quick as usual, till the increased Resistance put a new Stop to it, or the Pulse will intermit.

§ 18. The Deficiency of Spirits must needs relax all the Fibres, so that the Pores of the Skin will be exceeding wide, and therefore the Patient will *sweat*; and because the Motion of the Blood is so very slow, the Heat of the Blood, and consequently of the Sweat, will be less than that of a healthy Person, for which Reason he will judge it *Cold*.

§ 19. The Spirits still wasting, and the Viscidity of the Blood increasing, at length, they will be unable to contract



## 80 *Of Acute Distempers, &c.*

tract the Heart, and so the *Circulation* of the *Blood* will *cease*, or in other Words, the *Patient* will die.

§ 20. From hence we may conclude, how fit they are to be trusted with the Patient's Life, who, instead of *curbing* the too *impetuous Motion* of the Blood with *cooling Diluters*, and *moderate Evacuations*, do *spur* it on faster, with their heating *Cordials* and *Alexipharmicks*.

Though I have not attempted to explain every *Phænomenon* in the Distempers I have mention'd, (for that would have run me quite beyond my present Design in this short Essay) yet from what has been said, may be drawn several practical *Corollaries*, to direct us in a more rational Method than that which is too commonly, and every Body knows, but too *unsuccessfully* practis'd.

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C H A P.

## CHAP. VI.

## Of the Air.

§ 1. **T**HE *Air* which we continually breathe, and which constantly environs us, must needs impart its benign, or baneful *Influences*; according to the various Changes it undergoes, as to its *Gravity*, *Elasticity*, *Moisture*, *Dryness*, *Heat*, or *Coldness*; or as it has more or less foreign Particles, such as *Mineral*, *Vegetable*, and *Animal*, floating in it.

The *Air* is a compressible and dilatable *Fluid*, covering the Earth and Sea to a considerable Height, the lower Parts being always more compress'd than those above, and the Spaces into which it may be compress'd, are always reciprocally proportional to the compressing Weight; and because its Density is proportional to its Compression, its Particles do recede from each other, with Forces reciprocally proportional

tional to the Distances of their Centers, as Sir *Isaac Newton* hath demonstrated. (q)

§ 2. That the *Air* is really heavy, was first found out by *Galileus*, by trying to what Height Water might be rais'd by Pumping; and when he found it could not be rais'd higher than thirty-five Foot, concluded that it was from the Counter-balance of the *Airs* Weight that it was rais'd so high, and not from an imaginary *Fuga Vacui*.

§ 3. The Specifick Gravity of *Air* to *Water*, according to Mr. *Boyle's* Experiments, is as 1 to 1000; but comparing this with the Observations of Mr. *Halley*, and Sir *Isaac Newton*, 'tis perhaps, nearer the Truth to assign the Density of *Air* to *Water*, as 1 to 800, and the Density of *Mercury* to *Water* being as 14 to 1, the Density of *Air* to *Mercury* will be as 1 to 11200; so that the *Air* we breathe in, takes up 11200 times the Space that the like Quantity of *Mercury* would: And yet (r) Mr. *Boyle* hath found by Experiments, that the *Air*,

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(q) *Principia Philo. Mathem.* p. 23. L. 2.

(r) *Traacts about the admirable Rarefaction of the Air.*



without any *adventitious* Heat, may, by the Force of its own Spring, possess *thirteen thousand times* the Space it doth when pressed by the incumbent *Atmosphere*, and therefore may possess a Space *one hundred and forty five Millions and six hundred thousand times* greater than the same Weight of *Mercury*, and, by the Addition of Heat, it may be forced to fill a Space much larger. Now if we consider that the *Air* we breathe in may be compressed into *40 times* less Space than that which now it fills, it may then possess a Space *five hundred and twenty thousand times* greater at one time, than at another, for  $13000 \times 40 = 520000$ .

§ 4. This *Fluid* I have been describing, is so necessary, that an Animal cannot live a few Moments without it, as is evident from Experiments of their sudden Death in the *exhausted Receiver*; as also for this Reason, *that* so soon as the Blood ceaseth to *circulate*, the Animal dies; and it cannot circulate thro' the Body, unless it pass the *Lungs*, which it cannot do so long as they are unblown up. And it is only the *Air*, which, by its *Weight* and *Spring*, is able to dilate the *Trachea*, and puff up the little *Air-*

*Bladders*, whereby the Sides of the Blood-Vessels are drawn asunder, and Room made for the Passage of the Blood thro' the *Lungs*. And yet if the *Air*, by its greater Gravity, or Spring, should distend the Branches of the *Trachea*, and swell the *Air-Bladders* above what is necessary to increase the Diameter of the Blood Vessels to their greatest Length; it wou'd then, by taking up too much Room, press the Sides of the Blood Vessels together again, and so either retard or obstruct the Motion of the Blood through the *Lungs*. I shall transcribe some Propositions (*ex iis, quæ in prima parte respirationis, &c.*) of *Bellini's*, in his Preface to his Book *de Urinis & Pulsibus, &c.* to confirm my own Reasoning on this Head. ' *Propositio 22. Sanguis fluere per*  
 ' *Pulmones debuit, nec potuit iis non in-*  
 ' *flatis, potuit tamen per reliqua Viscera.*  
 ' *P. 23. ' Ducto in pulmonem aere ejus*  
 ' *momenti, quod ramis tracheæ ad obtusum*  
 ' *angulum convertendis, inflandisq; folli-*  
 ' *culis sufficiat, non tamen tanti, quod per*  
 ' *nimiam folliculorum extensionem iis ad-*  
 ' *volutos canales sanguinis occludat, totus*  
 ' *pulmo simul inflabitur, & sanguis per ip-*  
 ' *sum fluat.*

P. 24. 'Sanguis nihil patitur ab Aere, cujuscunq; momenti sit, dum in pulmone ducitur, neq; cum redditur, si minoris, aut majoris momenti fuerit: at vero cum expiratur aer momenti mediocris, tum sanguis ab ipso solvitur in minimas partes, & quidem sub ipsum expirationis initium, nihil deinde patiens per totam reliquam expirationem.

P. 25. 'Aer æquo rarior, & æquo densior non est idoneus respirationi, & utervis respiretur inter varias, & plures affectiones, brevi animal moritur.

§ 5. Let us now consider what happens upon the Inflation of the *Lungs*.

There is hereby Room made for the Blood to pass through the *Lungs*, which it cou'd not do before; so that were the *Lungs* to continue in this inflated Condition, there would be nothing to obstruct the Motion of the Blood through them, with whatsoever Celerity the Contraction of the right Ventricle of the Heart wou'd propel it.

Now the *Air* cannot remain in the *Lungs* without being much heated, and thereby have its Spring *unbent*, and so become specifically lighter than the external *Air*. For which Reason it will, by a known Principle in *Mechanics*, give



place to it, and rise to such a Height, as, till it meet with *Air* of its own Weight, and there it will remain.

Supposing then the *Lungs* always blown up, yet there would be a constant Supply of fresh *Air*, for all the Purposes the *Air*, as such, can be useful.

Therefore they are mistaken, who think, that Respiration (*viz.* an alternate Inflation and Sinking of the *Lungs*; together with a Contraction and Relaxation of the Muscles serving Respiration) is perform'd in an *Animal*, for the End the Blood may *circulate* thro' the *Lungs*, or that the *Air* may, hereby, blow up the Flame of Life, or *ventilate* and cool the too hot Blood in its Passage through the *Lungs*, or carry off the *fuliginous* Parts of the Blood; nor yet to impart its *Nitrous Salts* to dissolve the Blood, nor its *Elastic Particles* to communicate an *Oscillatory Motion* to the Blood: Some of these being generally suppos'd as the End of Respiration. For all these Ends, may be obtain'd, even whilst the *Lungs* remain inflated: Therefore *Nature*, which does nothing in vain, never design'd Respiration for any of these Ends, which may be accomplish'd as well without it.

§ 6. Now, since in Fact there is such a Thing as Respiration, let us observe what will happen, when, by any Means whatsoever, the *Air* is forc'd out of the *Lungs*.

§ 7. The Sides of the Blood Vessels, which by the Inflation of the *Lungs*, were drawn asunder, will now, the *Lungs* being crowded on a Heap, be forc'd together, and so the Blood contain'd in them, broken, and divided into innumerable small Parts, and thereby render'd more fit to pass the several *Strainers* of the Body.

§ 8. From what hath been said, it follows, that *Air* either too *dense* or *rare*, (tho' it be not to such a Degree as to become Mortal) as it is unfit for Respiration, so must necessarily be unhealthful, and consequently the highest Hills are unwholsome, as well as the lowest Vallies.

§ 9. And as the Blood upon this Score must be less broke and divided, it will dispose to all those Distempers which proceed from a too great Viscidity therein.

But there is scarce any *Chronical Distemper* but which may either derive its Original from, or owe its Growth to this

# 88. Of the Air.

Cause: As the *Jaundice*, *Cachexy*, *Dropsy*, *Asthma*, *Ague*, and the *Hypochondriacal Illness*; and there is no Distemper wherein the Change of *Air* is more useful than in *Consumptions*, sometimes doing more than any Medicine whatsoever could perform without it.

§ 10. Our Bodies are equally press'd upon by the incumbent *Atmosphere*, and the Weight they sustain is much greater than is commonly imagin'd, being equal to a *Cylinder* of *Air*, whose *Base* is equal to the *Superficies* of our Bodies. Now a *Cylinder* of *Air*, of the Height of the *Atmosphere*, is equal to a *Cylinder* of *Water* of the same *Base*, and 35 Foot high, as appears by *Gallileo's* Experiment of Pumping: So that every square Foot of the *Superficies* of our Bodies, is press'd upon by a Weight of *Air* equal to 35 *Cubical* Feet of *Water*, and a *Cubical* Foot of *Water* being found by Experiment to weigh 76 Pounds *Troy* Weight; therefore the Compass of a Foot Square upon the *Superficies* of our Bodies, sustains a Quantity of *Air* equal to 2660 Pound Weight, for  $76 \times 35 = 2660$ , and so many Foot Square as there is upon the *Superficies* of a Body, so many Times 2660 Pounds Weight does that Body



Body bear. So that if the *Superficies* of a Man's Body was to contain 15 square Feet, which is pretty near the Truth, he wou'd sustain a Weight equal to 39900 Pounds *Troy*, for  $2660 \times 15 = 39900$ , which is above thirteen *Ton*.

§ 11. The Difference of the Weight of the *Air* that our Bodies sustain at one Time more than at another, is also very great. The whole Weight of *Air* which presses upon our Bodies when the *Mercury* is highest in the *Barometer*, is, as I have already prov'd, equal to 39900 Pounds *Troy*. I shall now prove that the Difference between the greatest, and the least Pressure of the *Air* upon our Bodies, is equal to 3982 Pounds *Troy*.

The Difference of the *Air's* Weight at different Times, is measured by the different Height to which the *Mercury* is buoyed up in the *Barometer*, and the greatest Variation of the Height of the *Mercury* being three Inches, a Column of *Air* of any assignable *Base* equal to the Weight of a *Cylinder* of *Mercury* of the same *Base*, and the Altitude of 3 Inches will be taken off from the Pressure upon a Body of an equal *Base*, at such Times as the *Mercury* is three Inches lower in the *Barometer*. So that every Inch  
square

square of the Surface of our Bodies is press'd upon one Time more than another, by a Weight of *Air* equal to the Weight of 3 *Cubical* Inches of *Mercury*. Now a *Cubical* Foot of Water being 76 Pounds; a *Cubical* Foot of *Mercury* must be 1064 Pounds equal to 102144 Drams. And as 102144 Drams is to a *Cubical* Foot, or which is all one, 1728 *Cubical* Inches :: 59. $\frac{1}{11}$  Drams to one *Cubical* Inch. So that a *Cubical* Inch of *Mercury* (throwing away the Fraction which is inconsiderable) is equal to 59 Drams, and there being 144 square Inches in a Foot square, therefore a Mass of *Mercury* of a Foot square *Base* = to 144 square Inches, and 3 Inches high, must contain 432 *Cubical* Inches of *Mercury*, which being multiplied by 59 (the Number of Drams in a *Cubical* Inch of *Mercury*) makes 25488 Drams, and this Weight does a Foot square of the Surface of our Bodies sustain at one Time more than another. Suppose again, the *Superficies* of a Humane Body equal to 15 square Feet, then wou'd the Body sustain at one Time more than another, a Weight =  $15 \times 25488 = \frac{382320}{8}$  Drams (= 47790 Ounces) =  $3982\frac{1}{2}$  Pounds *Troy*.

§ 12. Now it is so far from being a Wonder that we sometimes suffer in our Health by a Change of Weather, that 'tis the greatest, we don't always so; for when we consider that our Bodies are sometimes press'd upon by near a Ton and half Weight more than at another, and that this Variation is often very sudden; 'tis surprising, that every such Change shou'd not entirely break the Frame of our Bodies to pieces, and be the constant Harbinger of sudden Death. One wou'd think that when so many of the Vessels of our Bodies are straitned by an increased Pressure, that the Blood wou'd stagnate up to the very Heart, which not being able to contract itself, the Circulation wou'd cease, and we shou'd die. But such is the Contrivance of infinite Wisdom, that when the Resistance to the circulating Blood is greatest, the *Impetus* by which the Heart contracts shou'd be so too: The Weight of the *Air* increasing, the *Lungs* will be more forcibly expanded, and hereby the Blood more intimately broken and divided, so that it becomes fitter for the most fluid Secretions, such as that of *Animal Spirits*, by which the Heart will be more strongly contracted. The  
Blood's



Blood's Motion towards the Surface of the Body being obstructed, it will pass in greater Quantity to the *Brain*, where the Pressure of the *Air* is taken off by the *Cranium*: And upon this Score more Spirits will be separated, whereby the Heart will be so strongly contracted, as to carry on the *Circulation* thro' the passable *Canals*, whilst some other are obstructed.

§ 13. There will be one considerable Alteration made in the Blood, upon the *Air's* greater or less Pressure on the *Surface* of our Bodies, *viz.* the Blood will be more or less compact; will be crowded into a less, or possess a greater Space in the Vessels it runs in. For the *Air* contain'd in the Blood, always keeps itself in *Æquilibrio* with the External Air that presses upon our Bodies; and this it does by a constant *Nisus* to unbend itself, which is always porportional to the compressing Weight by which it is bent: So that if the Compression or Weight of the *circum-ambient Air* be never so little abated, the *Air* contain'd within the Blood unfolds its Spring, and forces the Blood to take up a larger Space than it had before; for which Reason the Blood will be *rarified* into twice its Dimensions in the *exhausted Receiver*; and

and its only this Way the Operation of *Cupping Glasses* can be explain'd.

§ 14. The Alteration happens to *Vegetables*, and *Fermenting Liquors*, as well as to *Animals*. How considerable Changes are made by Heat, Cold, or great Winds, in *Fermenting Liquors*, is the Observation of every Body conversant with them. Now all these Changes are brought about, by altering, either the Gravity or Spring of the *Air*.

§ 15. And it's for this Reason that some People, by their *Pains*, can foretel any considerable Change of the Season, their Blood being more rarified against wet Weather, or high Winds, will more forcibly press the sensible Membranes, whereby *Pains* will be felt, they were free from before.

And this will the rather happen, because the Blood (how apparent the contrary may seem) will hereby become never a whit the more *Fluxil*; for *Froth*, which is Water blown into Bubbles by *Air*, is less *Fluxil* than Water itself; and the *Globules* of Blood being blown larger by the contain'd *Air* when the external Pressure is remov'd, is render'd less Fluid, and will pass the small *Capillaries* with greater Difficulty.

A Fluid

A Fluid must have its Parts small, smooth spherical or approaching thereto, and of equal Density, if the Fluid be *Homogeneous* by the 142 Prop. of *Borelli de Motibus a gravitate factis*. It is not necessary that the Parts should be in Motion, as Mr. Boyle imagines, because its neither apparent that the Parts of all Fluids are so, nor that the Parts of some Solid Bodies are not so. Therefore the Blood in this rarified Condition is rather less, than more, Fluxile, and this Condition it will be in, whenever the Air's Weight is lessened, or its Spring weakened.

§ 16. There is no Liqueur but what is something Viscid, that can be blown up into Bubbles, and the more tenacious the Parts of any Fluid are, the fitter it is for this Purpose; the Bubbles will be both larger, and more durable. A Mixture of Soap and Water may be blown into Spheres of above six Inches Diameter, and the Blood consists of Parts not unlike what is in such a Mixture. The Blood hath Watry, Saline, and Oily Parts, as is evident to the Senses: But that which puts it beyond Dispute, that the Blood is blown into such little *Spherule* (and perhaps  
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in the Manner Dr. Cheyne (s) has assign-  
ed in his *Philosoph. Princip. of Natural  
Religion*) is what may be observ'd, with  
a good *Microscope*, in the Tail of a Fish.  
The *Globules* of Blood being too large  
to pass the smallest Arteries, change their  
*Spherical* Figure, for one that is *Spheri-  
dal*, and recover their former Figure a-  
gain, when they come into a wider  
Channel. Now it is the Property of an  
*Elastic* Body alone, that when its Figure  
is chang'd, to recover it again: And no-  
thing being *Elastic* but *Air*, or what  
contains *Air* in it, it's plain that those  
*Globules* must be filled with *Air*.

§ 17. From what hath been said, it  
appears, that whenever the Blood is too  
*viscid*, so that the Force of *Cohesion* be  
not greater than that by which the con-  
tain'd *Air* endeavours to expand it self,  
the Person will be more sensibly affect-  
ed by Change of Weather; and from  
hence may be taken better *Indications*,  
both for the Prevention and Cure of these  
Distempers, than from any other *Sources*  
whatever.

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(s) P. 217, 218, &c.

They who understand this *Theory*, will know for what Reason, and in what Circumstances, moderate *Evacuations*, *Exercise*, *Steel*, and *Mercury*, are so beneficial in this Case, and will never use one of them, when another is more proper.

It would be the easiest Part of my Undertaking to be Particular in these Matters; but that it wou'd increase the Bulk of the Book to no Purpose; for they, who understand not these short Hints, will be no better for a more distinct Explication.

§ 18. I shall now enquire how the *Air* affects us, when 'tis too *Hot*, too *Cold*, too *Moist*, or *Dry*, &c.

There is none but who observe, what considerable Changes are made on the whole Face of Nature, by the Approach, or Recess, of the Sun's warming and enlivening Influences; the Fields, the Forests and the Gardens, put themselves in Mourning at his *Autumnal* Departure.

Animals of several Kinds retire to their Dens and Caves, to spin out an unactive Life in Sleep and Rest, till, by his invigorating Warmth, in his *Vernal* Return, he thaws their congealed Juices,

ces, and excites them to an active Life.

§ 19. In the Spring we see the Plants peep out of the Earth, Flower, and then Seed; the Trees Blossom; and Fructifie, the Birds Chirp and Sing for Joy of the approaching Summer. Whence is all this Life and Vigour, but from the Motion and Heat the Sun communicates?

The Sisy Juices are rarified, and made to mount up the slender Tubes of Plants, and expand their Fibres, whereby Vegetation is perform'd; an artificial Heat will do the same in *Green-houses*, which shews the Affinity between this and that of the Sun.

§ 20. So that *Heat* hath a Power of rarifying, and putting in Motion the Humors of our Bodies, and, if moderate, of relaxing our solid Parts; both which appears by the Swelling and Softness of our Skin and Veins, when we are well warm'd by the Fire. On the contrary, when we are cold, our Veins are sunk, our Skin hard, rough, and contracted; but if the Heat be excessive, it will contract as much as Cold. A little Heat which only serves to drive the Moisture out of a *Fiddle-string*, relaxes it; tho'

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a greater



a greater Heat shrivels it on a Heap. Either *actual* or *potential* *Cauteries* do the same, applied to any Part of our Bodies. Now as *Heat* affects us, by rarifying our Humors, and relaxing our Fibres, so it lessens the Spring of the *Air*, and therefore we don't only Perspire more (according to (t) *Sanctorius's* Observation) in Summer than Winter, but sometimes more than is consistent with Health and Strength, especially if of a weak and lax Constitution. Therefore the *Cold Bath*, the use of a *Brush*, and moderate *Exercise*, in the Morning and Evening, together with *Sub-acid* and *Sub-astringent* Food, is most proper for such People.

§ 21. It is not enough to know that Hot or Cold *Air* is the Parent of many Distempers, such as *Fevers*, *Agues*, *Cholicks*, *Pleurisies*, *Rheumatisms*, *Catarrhs*, *Consumptions*, &c. but also after what Manner it operates to their Production; otherwise we are as much in the Dark as ever, as to their Cure. And this is only done by applying the known and obvious Properties of Cold

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(t) *Medicina statica*, § 2. *Aphor.* 41.

and Heat, to the various Alterations made in the Body, whence those Distempers are denominated.

§ 22. That the *Air*, when too *hot*, especially if Moisture be join'd with it, disposes to malignant Fevers, is the common Opinion of Physicians, both Ancient and Modern; and the Method how *this*, as well as a great many other curious *Phænomena* in Nature are brought about, is clearly accounted for by a late Ingenuous Author (*u*). But if the Heat be excessive, tho' without Moisture, it produces *Diary Fevers*, and sometimes those which the Ancients call'd *Putrid*: Perspiration being too great, the Humors must remain viscid and dry, and so unfit for Circulation: The Fibres being relaxed also by the Expence of Spirits, and the cold Evening succeeding, the perspirable Matter is then retain'd, whereby the Heat is increas'd, together with all other *Feverish* Symptoms.

§ 23. *Agues* are *Epidemical* in the *Fens* of *Cambridge-shire*, and the *Hundreds* of *Essex*, both of them flat, watery Coun-

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(*u*) Dr. Mead's *Essays of Poisons*, p. 161.

tries, which fill the *Air* with Vapours, whereby its *Elasticity* is weakned, the Fibres of the Body relax'd, and the Pores of the Skin obstructed.

Upon all these Accounts the Blood will be apt to deposite a slimy *Lentor* on the Sides of the Capillary Arteries, and the Orifices of the Glands, as is evident from what hath been said already. But how this *Lentor* produces an *Ague*, will be too tedious to explain here; therefore I shall refer to what (w) *Bellini* hath writ on that Head; what he hath said being so full, that there is little or nothing else to be added on that Subject. Now if Coldness be added to the Moisture of the *Air*, it will so much the more certainly produce this Distemper; for Cold contracts, binds up, and makes the Blood more compact, so that its Motion becomes slower, and its Viscidity greater; wherefore a cold and moist Constitution of the *Air*, besides *Coughs*, *Distillations*, *Pleurisies* and *Rheumatick Pains*, ushers in *Agues*, and some *Fevers* very near allied to them.

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(w) De Febribus, p. 320, ad 401.



§ 24. We observe, that *hectic* and *consumptive* People are most in Danger in very hot or cold Weather: Heat relaxeth all the Vessels of our Bodies, opens the Pores of the Skin, and increaseth Perspiration, in which consists the essential Nature of a *Hectic*, (as (x) Dr. Cbeyne hath proved) and by weakening the Spring of the *Air*, disposes the Blood to be more viscid and dry, and so (by (y) *Bellini's* Theory) will increase that Distemper.

If the Season be excessive cold, the *Air's* Weight and Spring are both increased, and the *Tone* of the *Lungs* being much weakned in a *Consumption*, the *Air-Bladders* must be expanded above what is necessary, that the Blood may circulate through the *Lungs*; and then will it, in some Measure, be obstructed in its Passage through them, and so produce all the *Symptoms* that are the Consequents of such an Obstruction, as constant tickling to Cough, *Pleurisies*, *Inflammation* of the *Lungs*, &c. And besides this, the Cold, by closing the Pores of the Skin, will hinder Perspi-

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(x) *New Theory of Fevers*, p. 129.

(y) *Bel. de Urin. & Pulsibus*, p. 320.

ration, and thereby increase the Quantity of Blood, which will pass the *Lungs* yet more difficultly, and, for that Reason, will increase the recited Symptoms. And it is upon this Account also, that the Patient falls into a *Diarrhœa*; the Passage of the Serum, through the *cutaneous Glands* being stopp'd, it solicits those of the *Intestines*: But if an Entrance be refus'd here, the *Legs* swell, and *asthmatic* Symptoms increase, 'till the Patient die.

§ 25. Besides the sensible Qualities of *Heat* and *Cold*, *Moisture* and *Driness*, it is certain, from undoubted Experiments, that the *Air* is more or less stock'd with *vegetable*, *mineral*, and *animal* Substances: Rain Water contains as much vegetable Matter, as Spring Water does, though not so much, as River Water, according to (z) Dr. *Woodward's* Observations on *Vegetation*. *Colcothar* will, by being expos'd to the *Air*, turn into a *Vitriol*: The *Caput Mortuum* of Sea-Salt will, after being expos'd to the *Air* for some Time, afford a considerable Quantity of such Spirits, as were

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(z) *Philosoph. Transact.* No. 253.

distill'd from it before; (as Mr. *Seignette* told (a) *Lemery*) what becomes of the Matter we daily perspire? Certainly 'tis elevated into the *Air* we breathe in, and when a dead Body corrupts, our Noses will inform us of something exhaled from it.

§ 26. And, indeed, it can't but be so by the known *Laws of Nature*; for, by what Means soever a Body becomes divided, till some of its Particles become less than the compounding Particles of *Air*; (in a Proportion greater than that, by which the Density of one of these Particles exceeds the Density of a Particle of *Air*) they will be lighter, and so be elevated into the *Air*, until, by their *Coalition*, their Gravity be so much increased, as to sink them to the Earth again. And we need have Recourse to no other Cause, for the Production of this admirable Effect, even in the most hard and solid Bodies, than the *Rays* of the *Sun*. Mr. *Romer*, from his Observations on the *Eclipses* of the *Satellites* of *Jupiter*, demonstrates that Light is not above ten Minutes in pas-

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(a) *Course of Chymistry*, p. 285.



fi<sup>n</sup>g from the Sun to the Earth. Now, since the Earth is at least 10000 of its own Diameters distant from the Sun, therefore must the Light run 1000 of these Diameters in a Minute, which is above a hundred Thousand Miles in a *Second*; and if a *Bullet*, moving with the same Celerity, with which it leaves the Muzzle of the *Cannon*, require 25 Years to pass from the Earth to the Sun, as *Hugens* has computed it, then will the Velocity of Light, to that of a *Cannon Ball*, be as twenty five Years to ten Minutes, which is above a Million to one: So that the Particles of Light move above a Million of Times swifter than a *Cannon Bullet*; and may we not expect proportionable Effects from them, tho' they are so exceeding small? For the *Momentum* of any Body in Motion against another, is as a *Rectangle* under the Magnitude and Celerity of the moved Body. We may guess at the Effects of the *Rays* of Light separately, by what we observe, when collected together in the *Focus* of a Burning-Glass: For no *Body*, tho' never so compact, is able to resist its Force. *Gold* itself may be *vitrify'd* by the concenter'd Rays of the Sun, though it be unalterable by any *culinary Fire*,

*Fire* whatever ; as Mr. *Blondel* tells us, one Part exhaling, whilst the other is turned into *Glass*, and this in a few *Seconds* of Time,

§ 27. Now, from what hath been said, it appears, that the Rays of the Sun are not only able to *abrade* and file off from the most solid Bodies, such small Particles, as, being separated, will become lighter than any the least compounding Particles of Air, but also by the *Celerity*, with which they will be reflected, be enabled to carry into the *Air* such little *Masses* of Matter, as are really heavier than the *Air* they mount up in ; which, when the Force impressed (constantly decreasing) becomes less than will impel them higher, they must necessarily fall down to the Earth again, and so must variously affect our Bodies, both in their Ascent and Descent, according to their various Natures and Properties.

§ 28. The *Moisture* of the *Air* was very troublesome and unwholesome to the first *Colonies* in *America*, till their prodigious Woods were, in a great Measure, cut down, and their Land cultivated, whereby their *Air* became more *serene* and dry ; so that a woody Country

try must be unhealthful for such as are of a *lax* Constitution.

The Reason of this extraordinary Moisture in *Wood-land* is easily accounted for, from (b) Dr. *Woodward's* Observations on Vegetation, which are too tedious to insert here ; I shall only take Notice, ‘ That the Water in the Glass  
‘ that had no Plant in it, continued the  
‘ same Quantity at the End of the Experiment, as at first, tho’ a considerable Quantity was expended, by rising  
‘ through the slender *Tubes* of such  
‘ Plants as were in the other Glasses,  
‘ and that the largest thriving Plants  
‘ expended the most Water ; and that,  
‘ in some Plants, the Expence of the  
‘ Water to the Growth of the Plant  
‘ was as 700 to 1 ; there must then prodigious Quantities of Moisture exhale from the numerous Branches of large Trees, and when those Trees are also numerous, must needs make the *Air* foggy.

§ 39. The *Air* will not only be moist but partake something of the Nature of those Plants, thro’ which the Moisture exhales, and so may become more or

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(b) *Philosoph. Transact.* No. 253.



less wholesome on that Account ; for we know by Experience, that even fragrant Smells will so affect some *hysterical* Women, as to throw them into a *Syncope* : And there is no Constitution, which some Smell or other will not disorder ; and what a strong Smell will do suddenly, a faint one may do in Time. And tho' Custom may abate the Sense of it, as in *Tallow-Chandlers*, *Leather-Sellers*, and *Tanners* ; yet, by Degrees, it will operate effectually, to produce a Change in the Constitution, either for the better, or the worse, according to the different Subjects it hath to work on ; and it is from offensive Smells, among other Things, that Distempers are more frequent and dangerous in *Cities*, than the *Country* ; and the great Mortality, that is so often in *Camps*, is commonly owing to the same Cause : The Truth of this appears by the Caution given to the *Jews* : (c) *Thou shalt have a Place also without the Camp, whither thou shalt go forth abroad, and thou shalt have a Paddle upon thy Weapon, and it shall be, when thou wilt ease thyself abroad, thou shalt dig therewith, and shalt*

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(c) *Deuteronomy*, c. xxiii. v. 12, 13.

*turn the Back, and cover that which cometh from thee.* It wou'd have been impossible for so numerous a *Host* to have subsisted so long, without all that Care we read of in the History of their Passage from *Egypt* to the *Holy Land*.

§ 30. The Distempers, that rage most in *Camps*, are *Dysenteries* and *malignant Fevers*; and though the Passions of the Mind, and bad Diet, have a great Share in producing them, as I may observe under their proper Heads, yet nothing contributes more to the Production of such Distempers, than the *infected Air* they breathe in, occasion'd by that Filth, which is the necessary Attendant of such a Place, especially in *Sieges*, where the corrupted Particles of dead Bodies, both of Men and Beasts, fill the Air with an intolerable Stench; besides, the *Steams* that are raised into the *Air*, from the Bodies of Men and other Animals, by Perspiration, must so load the *Air*, as mightily to increase its Gravity, and the Heat of the *Camp* will also weaken its *Spring*; upon both which Accounts it will be unfit for Respiration, and thereby the Blood be *unbroken* in the *Lungs*, and so dispose to those Distempers that proceed from a viscid Blood; Such are  
*Agues,*

*Agues, malignant Fevers, and Dysenteries*, as is evident from the *Theory* of these Distempers.

§ 31. The *Air*, upon the *Sea* being too *salt* and *moist*, causes Diseases in *Seamen*, that we on the Land know little more of, than the Name: Their Diet, which is principally salt Meat, together with the Cold they are expos'd to, contribute their Share; but the *Air*, which they constantly breathe in, and which mixes itself with whatever they eat or drink, and which is always contiguous to their Bodies, must needs be a Principal in all their Disorders.

They are generally very *costive*; and (e) *Ramazin* observes, from *Bartholin*, that they require almost double the Dose of Physic to *purge* them, that other People do.

The *Salt* in the *Air*, and also in their Meat, *shrivels* up the Fibres of their *Guts*, and makes them almost insensible; and being the Expulsion of the *Fæces* is owing to the *peristaltic Motion* of the *Guts*, whatever abates that, as salt Things will do, it will make the Man *costive*,

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(e) De Morbis Artificum, &c. p. 224.



and will also lessen the Force of a purging Medicine. But the *Scurvy* is that Distemper they dread the most, and which few of them escape; and tho' there are so many odd Symptoms, as *red, blue, or black Spots* on the Legs, *extraordinary Weakness*, a *Redness* and *Itching*, *rotten Gums*, *stinking Breath*, *loose Teeth*, *unequal Pulse*, *violent Pains*, &c. yet they are all accountable for, from that Alteration of the Blood, which will be brought about by a *salt and moist Air*. From what I've said above, it will render the Blood more viscid than in a natural State, and the *Salt* in the *Air*, and especially the *Bittern* in that Salt which they eat, will heat and rarify this viscid Blood, and so increase its Celerity, and the *Globules* being greater, will stay in the Capillaries, till the Force of the circulating Blood either break them, or remove the Obstruction; from whence arises the *Spots* and *Itching* in the Skin; for *extravasated* Blood turns *livid*, or *black*; some of the *extravasated* Blood *putrifies*, so that the *Gums* rot, and the *Breath* stinks; *Pains*, irregular Pulse, and the other Symptoms, derive their Original from the same Source. That *Salt* is a principal Actor  
in

in this *Tragedy*, is confirm'd by the Observation of (e) the aforementioned Author, on those who work in making Salt. They are almost all *Cachectic*, *Hydropical*, with fordid Ulcers and Scabs upon their Legs, have voracious Appetites, are great Drinkers, and oft die suddenly.

§ 32. I might here take Notice of the Influences of the *Planets*, since they act only by altering the *Air* as to its Gravity or Spring, or by raising *Effluvia* from the Earth, and by their Heat, which is always proportional to their Light, being both as the Squares of their Distances, reciprocally, and as the Signs of the Angles of their Incidence. Those who think the *Planets* have no Influence at all, need but to read Dr. Mead's Book *de Imperio Solis & Lunæ*, &c. to be convinc'd of their Error; for he has, from Sir Isaac Newton's Principles, demonstrated the Necessity of their Influence upon human Bodies, so that what heretofore was only Conjecture, is now a demonstrated Truth.

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(e) Page 226.

§ 33. We may guess at the Effects of *mineral* Particles raised into the *Air*, either by the Heat of the Sun, or a *subterraneous* Fire, by the Alterations that are made in the Bodies of those who are most conversant with them. *Miners*, in general, are subject to *Asthma's*, *Consumptions*, *Apoplexies*, *Palsies*, *Cachexies*, *swell'd Legs*, *Falling out of their Teeth*, *Ulcers of the Gums*, *Pains in the Joints*, and *Tremblings*: In particular, *Lead* gives *Cholics* and *Palsies*.

*Copperas*, by its Stipticity, being constantly applied to the *Aspera Arteria* in Respiration, so contracts and straitens the Vessels, that the *Air* is not able to expand the *Lungs* to such a Degree, that the Blood may circulate freely; for which Reason, they who work upon it are, according to common Observation, *Asthmatic*.

§ 34. But of all others, the *Mercury Miners* are liable to the greatest Inconveniencies. \* *Fallopious* tells us, that in four Months Time they begin to tremble, and scarce any of them live three Years. They are subject to *Palsies*, *Vertigo's* and

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\* Tract. de Metal. & Fossilibus.



*Hætics*, as appears from the Authority of a great Number of Writers cited by *Ramazini* (t).

In order to account for those different Effects of *Mercury* upon Human Bodies, I shall premise, that it is capable of entering through the Pores of the Skin into the Mass of Blood, as appears by those who are *Salivated* by *Mercurial Unctions*; as also that *Miners* can change the Colour of Gold from Yellow to an obscure White, by holding it, for some Time, in their Mouths: Now *Mercury*, being enter'd into the Mass of Blood, of such as work daily upon it, must wonderfully dissolve, and rarify it; for it being about ten Times as heavy as the Blood, every Particle of it will have ten Times the Force to dissolve the Blood, that a Particle of Blood of the same Magnitude will have: For the *Momentum* of either a Particle of *Mercury*, or Blood, to break thro' any Obstacle, or overcome any Resistance, is as a *Rectangle* under the Celerity with which it is moved, and the Quantity of Matter contain'd in it, which is measur'd by its Weight.

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(t) De Morbis, Art. c. 1, 2, 3, 4.

Now the Celerity being the same in both, the *Momentum* must be as their Gravities; and the Gravity of *Mercury* to that of Blood, being as ten to one, the *Momentum* of *Mercury* must be ten Times as great as that of Blood. But if we consider how much more swiftly the Blood moves in those who have taken *Mercury* (the Pulse being both quicker and stronger) as also the Hardness and Exility of the Parts of *Mercury*, by which they act as so many little *Wedges* in dissolving the Blood, and removing Obstructions, we shall easily believe what Dr. *Cheyne* tells us (g). That the Blood, assisted by any considerable Quantity of *Mercury*, will be able to do as much, in the removal of Obstructions, in one Day, as the Blood unassisted in three Years.

The Blood being in this rarified Condition, will stretch the Sides of the Arteries beyond their usual Limits, and so the *Carotid* Arteries will press upon the *Optick Nerves*, and at every Pulsation of the Arteries, will shake the *Optick Nerves* and the several Branches of

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(g) *New Theory of Fevers*, 122.

'em dispers'd thro' the *Retina*, a little out of their Places; so that the same Object, tho' at rest, will every Moment paint its Image upon different Parts of the *Retina*, and therefore seem to move upwards or downwards, to the Right or Left, or circularly, according to the various Posture the *Retina* is put into; for 'tis the same Thing to us, whether the Object move, and the *Eye* be still, or the *Eye* move, and the Object be at rest: We shall, in both Cases, have the same Sensation, but in the Latter we are said to be *Vertiginous*; so that 'tis no Wonder that *Mercury-Miners* are subject to this Distemper.

This Extension of the Arteries may be *such*, from a greater Rarefaction of the Blood, as so to press and straiten the contiguous Nerves, that the Passage of the Spirits thro' 'em, to the Muscles, will be either wholly obstructed, or in part; so that there will be either a *trembling Motion*, or none at all.

Besides this, a *Palsy* is sometimes caused by the Hardness and Driness of the Nerves; whereby their Cavity is lessen'd, and the Motion of the Spirits obstructed; and upon this Account both Sense and Motion are taken away. From what



hath been said, it appears that *Mercury* hath a wonderful Efficacy in removing Obstructions, making the Blood fluxil, and scow'ring the Glands, whereby all Evacuations will be increas'd, and the Body depriv'd of its most fluid Parts (b); (for in all Secretions the most fluid Parts are first separated) so that the solid will become more dry than in a State of Health, which was to be prov'd.

There is yet another Reason why *Mercury* may, when receiv'd into the Body, in too great a Quantity, produce a *Palsy*: For if in any Artery there be so much *Mercury* amass'd together, that its Weight be able to resist the Force of the circulating Blood, so that the *Muscle* in which that Artery terminates, having its due Supply of Blood cut off, will lose its Motion. Any one may be satisfied of the Truth of this, by making a Ligature upon the descending Trunk of the great Artery of a Dog, for he will find him incapable of moving his hinder Parts. The same Thing may happen in the Nerves, whereby

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(b) By the 3d Proposition of Animal Secretion.

the Spirits are obstructed, so that we see, upon several Accounts, that *Mercury* may produce a *Palsy*.

But how it shou'd cause a *Hectic*, will not be so easily accounted for by those who subscribe to the common Theory. For *Mercury* is fitter to cure, than to cause, a *Hectic*, if owing to the Causes generally assign'd (i). *Etmuller* tells us, ' That the immediate Cause of a *Hectic*, ' is the Indisposition and unequal Texture of the Blood, caus'd by the salish Sharpness of the Lympha in the ' conglobate Glandules, and the Viscosity of that in the Conglomerate, ' from whence insue a deprav'd and ' diminish'd Fermentation, Weakness, ' Weariness and Deficiency of Spirits, ' and the whole Train of *Hectic* Symptoms; the saline and viscid Blood is ' render'd unfit for nourishing the Parts, ' and after Eating, when the thin Parts of ' the Chyle dilutes the Blood, and disengages the Salts, the Pulse is a little enlarg'd, and the Heat augmented, and ' after some Time, sink again to the ordinary Pitch; and the coarse Remains

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(i) Oper. Medica. cap de Febre Hectica.

‘ of the Chyle are frequently voided  
‘ by Night-Sweats, as having receiv’d  
‘ a vicious Tincture from the Saliva in  
‘ the Stomach’. What the Author  
means by an unequal Texture of Blood,  
will never be understood by those who  
know that the Texture of the Blood is  
never equal, even in a State of perfect  
Health, that is, its Parts are never similar  
and of equal Density; but could we  
conceive this unequal Texture of the  
Blood, and that which is still as difficult  
to understand, how the saltish Sharpness  
of the *Lympha* in the *conglobate Glandules*,  
and the Viscosity of that in the  
*Conglomerate*, can be the Cause of it, yet  
we know nothing fitter to blunt the  
Edges of sharp Salts, and remove the  
Viscosity of any Fluid in the Body, than  
*Mercury*; and therefore instead of causing,  
shou’d cure a *Hectic*. So that we  
must either quit the common Theory, or  
deny that *Mercury* can cause a *Hectic*; but  
since the Fact is certain, let’s try how we  
can Account for it. From what hath been  
said before, it appears that *Mercury* will  
wonderfully enlarge the Orifices of all the  
Glands of the Body; and by spending the  
Spirits in excessive Perspiration, will  
make an universal Relaxation of all the  
Fibres



Fibres in the Body, and the Diameter of Vessels will be hereby enlarg'd, and the Quantity of Blood mightily diminish'd, and the Strength greatly impair'd; for the Strength of an *Animal* is in triplicate Proportion to the Quantity of his Blood, &c. if the Reader understand but Dr. *Cheyne's Theory of a Hectic*, he can't but clearly see how *Mercury* may be the Cause of it.

§ 35. By those few Instances we see what vast Alterations may be made in the Constitution of an Animal, by the Operation of *Mineral* Particles, when by any Means admitted into the Mass of Blood, as they will be more or less, in Proportion to the Number of them floating in the *Air*: So that a Physician can't better spend his Time for the Profit of his Patient, than study the Constitution of the *Air* in which he breathes, it being the Parent of so many Distempers. In *London* People are *Costive*, *Asthmatic*, *Hysteric*, and *Hypochondraic*, as also subject to Fevers of several Kinds: The like I have observ'd at *Sheffield*, a great Manufactory for Knives, and all other Sorts of Iron Ware; which occasions the burning a prodigious Number

of Coals, which, by their fulphurous Vapours, will necessarily dispose to those Diseases.

And were we to consider the various Constitutions of the *Air* in the several Seasons of the Year, in Imitation of the great *Hippocrates*, or that nice Observer, our own Country-Man, Dr. *Sydenham*, we shou'd be able to foretel future Distempers with such Exactness, as would raise the Admiration of all that heard us, and might give Occasion to make use of such Things as are proper to prevent 'em, and so far assist us in discovering their Nature, as mightily to facilitate their Cure.

(k) *Hippocrates* tells us, That the Change of the Seasons is the principal Parent of Diseases, and no Wonder that it should be so, seeing the different Spring, Weight, Heat, Cold, Moisture, &c. of the *Air*, are able to make so great Alterations in a Human Body, as I have fully proved they are. I had thought here to have commented upon several of *Hippocrates Aphorisms*

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(k) *Aphor.* 1. § 1.

in § 3. about the *Air*; but considering the vast Difference of the Climate, where he lived, from ours, I concluded that many of his Observations would be useless to us, as I found, by examining, they were; therefore I rather chuse to give an Account of the various Constitutions of the *Air* in *London*, taken Notice of by that sagacious and indefatigable Searcher into Natural *Phænomena*, Dr. *Thomas Sydenham*, for 14 Years together, viz. from the Year 1661, to the Year 1675.

*An Abstract of Dr. Sydenham's History  
of Epidemick Constitutions of the  
Air.*

§ 1. **H**E tells us, That from the Year 1661, to the Year 65, the *Depuratory* and *Intermitting* Fevers of all kinds, were *Epidemical*.

§ 2. In the *Depuratory* Fever, besides the Common Symptoms of other Fevers, he observ'd that the sick Person is very Faint, Vomits, or enclines thereto, the Tongue is black and dry, there is a sudden Prostration of Strength, the external Parts are dry, the Urine is thick, or  
thin,



thin, each a Sign of Crudity; in the Declension a *Diarrhœa* happens, (unless it be prevented in the Beginning) which protracts the Disease, but of its own Nature, it terminates in 14 or 21 Days, with a gentle Sweat. Other Symptoms happen upon irregular Practice.

§ 3. He begins the Cure with *Phlebotomy* in *Plethorick* Constitutions, which he repeats or omits, and gives Cordials more liberally or sparingly, and loosens or binds the Belly, as the greater or less Commotion of the Blood indicates; after *Venaesection*) if it be necessary) if the Patient *Vomit*, or have a *Nausea* at his Stomach, he prescribes a *Vomit*, and an Opiat at Night after it, by which Means a *Diarrhœa* is prevented; so certain is this, that if a *Diarrhœa* happen in the Declension, you may be sure there was either a *Nausea* or Vomiting in the Beginning and no *Vomit* given. He adventures to *Vomit* them in any *Stadium* of the Distemper, if a present *Diarrhœa* and *Nausea* indicate it.

In the *Autumn*, *Bleeding* and *Coolers* are not so safe, but a *Vomit* is necessary, after a laudable Sediment in the Urine, shews the Fever to have left the Patient, which commonly happens on  
the

the fourteenth Day, if Nature be not disturb'd by too cooling a Method; in which Case it falls out about the twenty-first Day; a Purge is to be administered: Till then he is to lie in Bed. Sometimes, especially in old Men, a Cough, with spitting much tough Matter, succeeds a Fever, which is cured by moderate drinking of generous Wines. *Opiats* ought not to be given till the End of the Fever, and after Purging, if possible.

§ 4. Here we have a most accurate History of this Fever, with all its distinguishing Characteristicks, and a Method of Cure, establish'd upon a long *Series* of Experiments; and how rational it is, will, in part, appear, by what I have already said of Fevers, and be farther illustrated by what I am about to say. Faintness, Prostration of Strength, Dryness of the Tongue and Skin, are accounted for before: I shall now shew, that when the Blood is in too great an Agitation, (which is all our Author means by Crudity,) the *Urine* will be clear and thin, or thick and muddy. Perspiration will be stop'd, the Skin being dry, and the saline Parts of the Blood, which used to be evacuated that Way,

Way, will be retain'd among the *Serum*, which, together with the greater Heat, will stimulate the *Kidneys*, whereby they will be so contracted, as to let out nothing but the most thin Part of the *Serum*. And so violent may the Motion of the Blood be, as to break some of the solid Parts into such small Particles as will, with the *Serum*, pass the *Kidneys*, (especially if by any Means their Fibres be in the least weakened and relax'd) and after they are separated from the Body, so obstruct the Rays of Light from passing directly through the *Urine*, as will make it appear thick and turbid; and besides this, the *Urine* will be less fluxil upon the Account of this Mixture, for the Viscidity of Liquors is owing to the Quantity and Figure of the Solids which swim in them, and the different Degrees of *Attraction* those Solids have among themselves.

§ 5. The Reason why a *Diarrhœa* happens in the Declension, when no Vomit hath been given in the Beginning, and why a Vomit prevents it, is, because a *stimulating* Matter lying in the Stomach for some Time, as it causes *Nausea's* and vomiting whilst it remains there; so after it is protruded into the *Guts*, as it  
some-



sometimes will be, will act its part there, and cause a Purging: But on the contrary, this Matter being evacuated by a timely Vomit, and the Stomach regaining its Tone again, is better enabl'd to perform its Office, whereby the generating of such Matter is prevented. There are several other Advantages accruing to the Patient by this means, as you may see in (1) Dr. Cheyne's *New Theory of Fevers*, yet I have frequently observ'd the Patient much worse upon taking a *Vomit*; for Vomiting is not always to be cured by a Vomit, but sometimes by such things as moisten, soften and relax the too tense and irritated Fibres of the Stomach: Besides, there are some of so delicate Constitutions, as are notable to bear such violent Commotions without the greatest Hazard: Which therefore put me upon contriving another Method less obnoxious to those Inconveniences, and that at last I hit upon; for by a proper Management of gentle cooling Purgatives, of which there are some very agreeable to the Stomach of such as are in a Fever, all is done that is

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(1) Page 72.

expected from a Vomit (except the Effects of a violent Contraction of the Muscles of the *Abdomen* and *Diaphragma*) both with more Ease and Safety. *Vomitting* is more necessary in the *Autumn* than the *Spring*, according to our Author's Observation; for in that Season of the Year, the Humors of our Bodies are more Viscid, and the Vessels, in which they circulate, more lax and yielding, upon both which Accounts, Vomiting is more proper. And it is upon this Account that *Bleeding*, and too cool a *Regimen*, is so dangerous in this Season.

Tho' I have been very short in my Reasonings, upon this Fever, yet I have exceeded my own Design; therefore resolve to be more brief upon the Other.

§ 6. The *Intermitting Fevers* of this Constitution he reduces to *Vernal* and *Autumnal*; the *Vernal* generally begin in *February*, the *Autumnal* in *August*; the *Vernal* are *Quotidian*, or *Tertian*, and are short and wholesome, except they be protracted by unnecessary Bleeding or Purgings.

The *Autumnal* are *Tertian* or *Quartan*, the first not so dangerous, often leaves them,

them about the Winter *Solstice*, the other is more dangerous, which often produces the Scurvy, Inflammation of the Tonfils, hard Bellies, and the Dropsy; the Young sometimes get quit of it in *December*, but oftentimes not till *March*, and if Bleeding and Purging have weakned 'em, then not till next *Autumn*: It's more dangerous to the Aged.

Those who have had a *Quartan*, if they have it a second Time, it lasts not over two or three Paroxyfms.

The *Vernal* are to be left to Nature, for they never kill. He found Vomiting good before the Paroxyfms, and Sweating after them.

The *Autummal* are more difficultly cured. If the Constitution be *epidemi-cal*, the Adult are seiz'd in *June*; if not, in *August*, and the Beginning of *September*, they rather remit than intermit, for the first Days.

§ 7. The Author thinks there is a great Affinity between these Fevers and the *depuratory*; for he observes, that ordinarily the *Depuration* of the Blood is perform'd in 336 Hours, and if we reckon five Hours and a half for a Paroxyfm, in intermitting Fevers, then so many



many Fits as, at five Hours and a half a-piece, amounts to 336 Hours, will terminate the Distemper, if left to Nature, which is agreeable to Observation: And for this Reason 'tis, that *Tertians* continue longer than *Quotidians*, and *Quartans* than these, being longest in running the Circuit of three hundred thirty six Hours.

§ 8. I shall take no further Notice of his Method of Cure, being every Body knows that the *Cortex*, rightly administered, is a *Specific* in all Kinds of intermitting Distempers; I say, if rightly administered, because I have known it often unsuccessful, when given by an unskilful Hand. In particular, a Tradesman in *Sheffield*, who was worn almost to a *Skeleton*, by a Quartan Ague he got in *Essex*, which he had labour'd under for a Year, when I was consulted: Besides a great many other Medicines, he had taken above half a Pound of the *Cortex* without any Advantage; and finding his Stomach quite gone, and he constantly faint and chill, after I had vomited him with *Vinum Benedictum*, I cured him, by giving him only two Ounces of *Cortex*, with a good Quantity of *Rad. Sepentar. Virginian.* added to it,

it, by which, both its heating Cordial, and dissolving Properties, were increased.

§ 9. The next Constitution begun in 65; for after a very cold Winter, and dry Frost in the Spring, till the End of *March*, which then ended with a sudden Thaw, in the Year 65, Multitudes died of *Pleurisies*, *Quinsies*, *Inflammations* of the *Lungs*, and such like Distempers; from which Time a continual *epidemical* Fever begun, worse than the *depuratory*; the Head-ach and Vomiting were more grievous, the *Diarrhœa* was increas'd, not lessened by a Vomit, and the Vomiting made worse; the external Parts were dry, yet, after Bleeding, Sweat might easily be forc'd, at any Time of the Distemper, with some Advantage, which could neither easily be done in the *depuratory*, nor, if it could, was it without Danger, till the 14th Day. The Blood in this Fever is somewhat *pleuritic* or *sizy*.

§ 10. The Blood being made very susceptible of Motion, and spirituous, by the preceding frosty dry Weather, and the Fibres of the Body being relaxed, and the Pores obstructed by the sudden Thaw, do certainly dispose to the Distempers

tempers above recited: The Truth of this is deducible from what I have said in several Parts of this Book, so shall not trouble the Reader with my Reasons here. Vomiting is improper in this Fever, for the same Cause I have rejected it in the *depuratory*, the Inflammation being greater, and the Motion of the Blood swifter, the Tensity of the Fibres are such, as not to bear the least Irritation, for which Reason, Bleeding, and gentle Sudorifics, must be useful: But 'tis best, for the same Reason, to force Sweat by Liquors actually hot, together with the Weight of Bed-cloaths, rather than by the *Alexipharmics* commonly prescrib'd.

§ 11. After this began the *Pest*, which increased till the *autumnal Equinox* in the Year 66, when it destroyed about 8000 in a Week; from thence it abated till the Winter-Cold almost vanquish'd it: In the Spring it quite ceased. The former Fever remain'd (tho' not so epidemical) till the Beginning of the Year 67.

§ 12. At which Time the third Constitution begun with the *Small Pox*, which increased till *Autumn*, and then were *epidemical*, and from thence decreased



creas'd [till the next Spring, (*viz.*) 68, when they begun to rage violently, and continued till frosty Weather next Winter, which abated them; then, in the Spring 69, they appear'd again, tho' not so universally as before, and lessen'd, till August 69, when they gave Place to an *epidemical* Dysentery.

§ 13. A Fever, which the Doctor calls *Febris Variolosa*, begun, when the small Pox begun, in 67, and ended with them in 69, it had all the Symptoms of the Small Pox, save those that attend the Eruption, Maturation, &c. of the *Pustules*. The Signs are, a Pain on the Heart-pit, especially if pressed, Pain in the Head, and Heat of the whole Body, with purple Spots, not very thirsty, the Tongue and Urine natural in the Beginning, except that the Tongue be sometimes white, seldom dry, and never black, a *Phrensy* and Encrease of the Spots from a hot *Regimen*. There are symptomatic Sweats in the Beginning; irregular Practice protracts the Fever to five or six Weeks, if Death prevent not. Critical *Salivation* towards the End terminates the Distemper, if cooling Medicines have been given, and

neither violent Sweats, nor Purging prevented it.

§ 14. Where the Strength will bear it, he begins with Bleeding, which he repeats every other Day, and gives a Clyster on those Days he does not order Bleeding, and cooling Julaps, with Whey, or Barley Water, *ad libitum*: The Patient must rise out of Bed every Day, notwithstanding he sweats: A *symptomatic Diarrhœa* is best cured by *Venaesection* and Coolers. After the *Salvation* is begun, no Evacuation is proper.

§ 15. A *Diarrhœa*, suppos'd to be the variolous Fever turned upon the Guts, and of great Affinity to it, raged all Summer in the Year 69: It was made worse by *Purging* and *Astringents*, but cured by the same Method with the Fever, (*viz.*) by Bleeding and Coolers. I shall only observe here, that most Distempers have some Affinity with the general ones of every Constitution; which gives an useful Hint to direct us in their Cure, with greater Certainty, and better Success, than otherwise we could expect.

§ 16. This *Diarrhœa*, which begun the 4th Constitution, was succeeded by the foremention'd *Dysentery*, and, in the  
Begin-

Beginning of *August* 69, the *Cholera Morbus* was more *epidemical*, than ever he (our Author) saw it, which yet lasted but till the Beginning of *September*, no more than it does other Years, when it is *epidemical*, tho', from evident Causes, it happens at any Time of the Year.

§ 17. About the End of *Autumn*, *Tormina* without Purgings, or the dry Gripes begun, but ended in Winter; yet the *Dysentery*, that begun with it, continued very *epidemical*, but in very cold Weather ceased.

§ 18. The *anomalous Small Pox* begun in *January* 16<sup>th</sup>, as the *Dysenteric* Fever did the *August* before, which continued all the *dysenteric* Constitution, which ended in 72.

§ 19. The *anomalous Small Pox* begun in *January* 69, and continued to the End of the *dysenteric* Constitution in 72. They gave Place to the *Dysentery* always in *Autumn*, and the *Dysentery* to them in *January*, till the last *Autumn*, in which they both raged: Besides the common Symptoms with the other, they differ'd as follows.

In the *Discreet*, when they are very distinct, they appear the third Day; in



the regular not till the 4th; they are less and rougher in these, in the Progress of the Distemper, than in the other; they are oftner black, after they are ripen'd, than the other; sometimes (tho' seldom, if the Pustules be very few) they salivate.

In the *Confluent* they differ in this; sometimes they shew themselves the second, and sometimes the third Day, like a reddish uniform Tumor, which covers the whole Face, harder than an *Erysipelas*, without any visible Distance of the Pustules; the rest of the Body was cover'd with numberless Pustules join'd together, of a red Colour, and sometimes, tho' but seldom, is there this mortal Symptom, viz. little Bladders between the Pustules of the Thigh fill'd with a limpid *Serum*, which, being broke, runs out, and the Flesh under them is as black, as if *sphacilous*. About the 11th Day, a whitish *Pellicle* appears upon diverse Parts of the Face, on that reddish Tumor before describ'd: This *Pellicle*, in a little Time, eructates a crusty splendid Matter, of a deep red Colour, like concreat Blood, which, ripening, grows blacker, till the Face be as black as a Coal: The fourteenth, and sometimes the

the seventeenth, is the *critical* Day in these, if over hot *Regimen* kill not the Patient sooner.

In these all the Symptoms are more grievous, the Inflammation is greater, the Pustules less, and more angry, scarce distinguishable from an *Erythipelas*, or the *Measles*, but by the Times of their Eruption. When the Pustules fall off, the surfuracious Matter stays longer, and the Scars are worse.

§ 20. His Cure, besides *Hypnotics*, when either Sickness, Watching, or *Delirium*, indicate (which must only be given to the Adult, in the Distinct) a more cooling Method must be used, in Proportion to the Inflammation, which when greater, drink plentifully of the *white Decoction* made very thin, or Milk and Water, both which promote the Salivation; and tho' the *Menses* should flow, yet let the Patient drink plentifully.

§ 21. The *dysenteric* Fever begun in *Autumn* 69, and continued during the *dysenteric* Constitution. This Fever seiz'd those who had no *Dysentery*, only sometimes they had slight Pains, either with or without Stools. It had all the *Dysenteric* Symptoms, except Purging,

and its Consequents; in the first Year of this Constitution, there were some gentle Pains, but after that scarce any: They sweat very little, or none at all, but the Pain of the Head is greater in this than in the *Variolouse*; tho' the Tongue, as in the *Variolouse*, be moist, and white, yet hath it also a white *Pellicle* over it: It seldom terminates by Salivation, as the other doth. In the Declension, the Patient is more troubled with *Apthæ*, than in any other Fever, especially after a hot *Regimen*; if Sweat be forced in the Beginning, it causeth a *Coma*.

§ 22. The Cure is, by bleeding and purging every other Day, for several Times, without Opiats after them: Use a slender Diet. After the second Purging the Patient may eat Chickens, and the three Days after the last Purge, if the Patient be very weak, as *Hysterical Women* generally are, a gentle Opiat mightily recruits, but does Hurt before.

§ 23. The regular *Measles* begun in *January*, 167 $\frac{1}{2}$ , increased till *March* the Tenth, then decreased till *July*, when they quite disappeared. The *Small Pox* abated in *August* 7<sup>1</sup>, and the *Dysentery* returned more violently than before, but in  
the



the Winter gave Place to the *Dysenteric* Fever, and Small Pox again, which ragged all Winter. (*February* is the common *Epocha* of Vernal Fevers, as *July* is of the *Autumnal*) in the Beginning of *February* a *Tertian* took place, tho' not very *Epidemical*, the other Fevers abated, and the *Tertian* vanish'd about the Summer Solstice, as the Vernal *Tertians* commonly do. In *July* 72, the *Dysenterick* Fever begun again, tho' milder in the latter End of *Autumn*, when the *Dysentery* return'd, which gave place again in Winter to the *Dysenteric* Fever, and the Small Pox; when I say one gave Place to another, I only mean they were not so *Epidemical*; for each Distemper generally invades some, throughout the whole Constitution.

§ 24. Through this Constitution the *Dysenteric* Fever begun in *July*, the *Dysentery* was *Autumnal*, the Small Pox begun in *January*, the *Dysenteric* Fever abated, and the Small Pox continued till *July*, when the *Dysenteric* Fever begun again.

§ 25. The fifth Constitution takes Place from the Beginning of *July* 73. In the Beginning of this Constitution the Fever gave greater Signs of a more Spirituous

ritous Inflammation, (as most *Epidemical* Distempers do) than it did afterwards; for at its Beginning, as also the Spring after, there were Signs of a *Pleurisy*, the Blood was Pleuritick the first or second Time the Vein was open'd.

Besides the Symptons common to all Fevers, there are these especially in this, *viz.* violent Pains in the Head and Back, a *Stupor* and Pain in the Joints, a tense Pain in the Limbs, and even the whole Body, but less than in a Rheumatism; for the first Days, Cold and Heat succeed each other: Sometime in the Beginning of the Distemper they sweat a little; when the Fever is left to it self, the Tongue is moist and whitish, and scarce any Thirst; the *Urine* almost natural, but if the Patient be heated too much, the Tongue is dry, and of a Colour between Brown and Yellow; a great Thirst, and the Urine very red; if it be rightly treated, it ends in 14 Days, if otherwise, then not till the 21st. Sometimes the Patient hath a *Coma*, which lasts two or three Weeks, and then he recovers not till the 28th or 30th Day. The first Sign of it is the Desire of some absurd or unaccustomed Meat, which may be granted him in a little Quantity.  
Some-

Sometimes the Head nods, this and that Way, by Reason of Weakness; faint Sweats which succeed the Fever, may be cured by generous Wine. A Dyfentery, and Diarrhœa, in Autumn, 75, succeeded, which was nothing else but this Fever thrown upon the Guts.

§ 26. The first Thing in the Cure is to let Blood, then apply a *Vesicatory*, and after that give a Clyster every Day, and use a cold *Regimen*: After the 14th Day leave 'em to Nature, give small Beer *ad libitum*, and if there be a *Phrenzie*, drop *Spirit of Vitriol* into it.

§ 27. This Fever was not very *Epidemical* till July, in the Year 75, neither were the forementioned Fever, nor the Small Pox, that begun in 70, quite excluded in 73, tho' the Symptoms of the Latter were much milder, there were yet, *viz.* in 73, a few in the Dyfentery; the Small Pox kept Pace with the Fever, I last describ'd, all Winter, but neither very *Epidemical*. In *Christmas*, being very warm after a hard Frost, there were some Dyfenteries which then quite ceas'd.

§ 28. In *January* 167<sup>3</sup>, the *anomalous Measles* begun and increas'd till *March*, and ceas'd in *June*. They were very  
*Epi-*



*Epidemical*, the *Febris Morbillosa* bore the same Date, and had the same Period. At the same Time begun the *Black Small Pox*, which raged more or less, till about June 75.

The *anomalous Measles*, as they were very *Epidemical*, so were they Mortal, if wrong treated; the Eruption happened sometimes sooner, and sometimes later than the Fourth; the Pustules in these First occupied the Shoulders and Trunk, in the other, viz. the Regular, the Face, the branny Scales which defile the *Cuticle* in the End of the Distemper, in the other, rarely happen in these, the Fever and *Dyspnoea*, in the End of the Disease, are more vehement, and liker to a *Peripneumonia* in these, than in the other.

§ 29. The Cure. Put them to Bed two Days before the Eruption, with their usual Covering, give them Oat, or Barly Grewel, roasted Apples, small Beer, Milk and Water, and a Pectoral Ptisan.

§ 30. The *Febris Morbillosa* differ'd from the Measles, in that the Pustules which imitated the Measles were few, and broke out on the Back of the Neck and Shoulders, and some on the Trunk; the

the Fever is of the same Kind with the Measles, but more vehement, and sometimes continued 14 Days or more. Bleeding and Clifters do harm; it is cured like the Measles of the same Constitution.

§ 31. The Black Small Pox, which begun *January 1672*. The Confluent were of a fuscous Colour whilst unripe, but black when ripe; they differ but in few Things from the *Anomalous*, in 69, they are more putrid, and smell worse: When ripe their Matter is more gross, and more difficultly digested. This is worth remarking, that by how much the milder the Small Pox are, by so much sooner the Pustules ripen; for in the regular Confluent, the Patient was past Danger the 12th Day, in the Anomalous Confluent in 70, they were past Danger the 15th, or 17th Day; but in these they often die after the 20th Day; and sometimes, if they recover (which rarely happens) the Legs not only swell, (as they commonly do in all the confluent Kind) but the Arms, Shoulders, Thighs, and other Parts, with intolerable *Rheumatick* Pains, which sometimes end in *Impostumations* of the Musculous Parts, by which the Life is in Danger after

after the Pox hath left them. These Pox are almost as fatal as the Pest.

§ 32. The Cure. A hot *Regimen* increaseth the Fever, and causeth a *Pleurisy* and Purple Spots; too cold a *Regimen* hinders the Swelling of the Face and Hands, and prevents the Plumping of the Pustule, which are all necessary. Most dy'd that us'd the Method formerly prescrib'd, but not with the following, *viz.* after the 5th or 6th Day, the Patient must drink plentifully of small Beer, with *Spirits* of *Vitriol* in it to the End of the Distemper, especially at the Maturation of the Pustules when the Fever is highest. The Adult must have *Laudanum* every Night after the Eruption; a Glass of Sack may be given towards the End of the Distemper, if the Faintness of the Patient require it.

§ 33. After a very warm Season, which continu'd to the End of *October* 75, sudden cold and moist Weather succeeded, which occasion'd the most *Epidemical Cough* that ever our Author observ'd, which ended in a Fever, like that in 73, and counterfeited a *Pleurisy*, and *Peripneumonia*; there was Pain in the Head,



Head, Back and Limbs ; it abides not the Bleeding that a true *Pleurisy* doth.

§ 34. The Cure. When there is nothing but a Cough, a cooling Diet without flesh Meat, and strong Drink, is sufficient. If the Fever be begun, bleed, apply a blistering Plaister to the Neck : Give every Day a Clyster ; keep not too close in Bed ; bleed again the third Day, if the Pain abate not, and continue Clysters, but not to *Hysterick* and *Hypochondrickal* Persons; and, if extraordinary Heat requires it, bleed again.

§ 35. I had not been at so much Pains to contract and methodize the Doctor's History of these Distempers, but that it is the most exact of any extant, and done by one on whose Integrity we may depend, and to render it more useful by the succeeding Corollaries. It is not enough to read such a History, tho' never so true and critical, the Memory being not able to retain the tenth Part, of it, even tho' it were contracted; but we must carefully consider each Part separately, and so compare one Part of the History with another, as to draw general Conclusions from them, which being but few in Number, are easily remembered, and so will become useful in Practice.

Etice. And if every one that is capable wou'd contribute his Share to so beneficial an Undertaking, we might, in a little Time, be furnish'd with *Maxims* to direct us in a more successful Practice, than what is known at present.

*Corollaries from the preceeding History.*

I.

Different Constitutions of the *Air* the Cause of different Distempers, and those Distempers are generally stated and regular, as appears from the History in general.

II.

The Distempers of each Constitution having an Affinity to each other, tho' they differ in several Respects, yet require something common in their Cure, as proceeding from a common Cause: So that he who is able to Cure one *Epidemical* Distemper in any Constitution, hath an Advantage in the Cure of all the other. By § 7, 13, 15, 18, 21, and 30.

III.

## III.

*Intermitting Fevers*, and such continual ones as are allied to 'em, are protracted by a cold *Regimen*. By § 3, and § 6. compared with § 7.

## IV.

To know how *Specifics* operate in the Cure of Distempers, is not only useful to the right administering of 'em, but also shews us how to improve their Virtues. By § 8.

## V.

Cold, frosty Weather often puts an End to *epidemical* Distempers, such as the *Plague*, *Small Pox* and *Dysentery*. By § 11, 12, 17.

## VI.

A hot *Regimen* pernicious in the *Small Pox*, *dysenteric Fever*, and in most continued ones, the worst Symptoms are owing to it. By § 13, 19, 21, 25, and 32.



## VII.

There is a Consent between the Skin and the Intestines according to *Baglivi's* Observation. By § 19, 23, and 24.

## VIII.

Plenty of cooling Liquors proper in the *Small Pox* and *Inflammatory Fevers*. By § 20, 26, and 32.

## IX.

The *Small Pox* and *Measles* generally begin in *January*. By § 18, 19, 23, 28, and 31.

## X.

A cold and moist Constitution of the Air disposes to an *epidemical Cough*. By § 33.

## XI.

*Hypochondriac* and *Hysteric* Persons are not to be treated like other People in Fevers, they cannot bear so large Evacuations. By § 34.

C H A P.

## C H A P. VII

## Of Bathing.

§ 1. **T**O what I have writ concerning the *Air*, I shall subjoin some Thoughts of the Nature and Use of *Bathing*, by which we are render'd sometimes more, and sometimes less capable of bearing the Injuries of it, *viz.* the *Air*, according to the Heat, Temperature, or Coldness of the Bath. To which I shall annex some Observations upon, and Directions about wearing of Flannel.

§ 2. Tho' Bathing hath been mightily neglected in the last Age, yet it hath been the ancient Practice both of the *Jews* and *Romans*, not only as a Cure of several Distempers, but also for Cleanliness and Delight. The Use of the Bath, especially the Cold, is so much reviv'd within this few Years, and the Success of it in the Cure of many Distempers being so extraordinary, I question not but, in a little time, Bathing

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will

will be as much in vogue among us, as heretofore among the Ancients.

§ 3. *Sanctorius* tells us, That Swimming in Cold Water hinders Perspiration. (m) And

That the Flux of the Belly is cured by promoting Perspiration, (*viz.*) by warm Bathing. (n)

That *Hypochondrical* Persons are much eased, if their Bodies be render'd perspirable by frequent Bathing. (o) And

That Washing with cold Water heats robust Bodies and refrigerates weak ones. (p) And

Warm Bathing, unless Crudities withstand, helps Perspiration, and refrigerates the internal Bowels. (q)

Bathing hath been often used with Success in the *Scab*, the *Leprosy*, *Elephantiasis*, and most Defædations of the Skin. In Variety of Pains, as *Chronical Rheumatisms*, *Gout*, *Sciatica*, *Lameness*, from either too great Contraction, or Relaxation of the *Tendons*.

(m) *Apbor.* 67. § 1.

(n) *Apbor.* 92. § 1.

(o) *Apbor.* 102. § 1.

(p) *Apbor.* 1. § 2.

(q) *Apbor.* 2. § 2.



I sent a Gentlewoman to St. *Mongath's* Well, who was cured of an *Oedematous Tumor* in her Ankle, by Bathing; which wou'd not yield to any Method that had been used, as Plaisters, discustive Fomentations, with *Sal Armoniac* dissolv'd in 'em, Tinctures of *Myrrh* and *Camphire*, *Oyl of Tartar, per deliquium*, laced Stockins, &c. She bath'd her whole Body once a Day, to give a general Contraction and Tensity to all the Vessels, and promote a Dissolution and better Circulation to all the Humors; but bath'd her swell'd Leg several Times every Day, and kept it not too long in the Water at a Time, for fear of chilling it; so that the Vibrations of the Fibres being made stronger and quicker so often in a Day, the obstructing Matter was remov'd, and the Vessels enabled to resist the distending Power of fresh Humors.

I am persuaded that a prudent Management of the Cold Bath, wou'd be very powerful in the Relief of *Cachectic* and *Hydropic* People, provided the Distempers be not too far advanc'd, and some dangerous Symptoms in a *Consumption*, if the *Lungs* be found, would better be remov'd this Way than any

other: But this is not to be attempted without the Advice of some judicious Physician. 'Tis a Specifick in the *Rickets*; *Hæmorrhages*, whether from the Nose, Guts or *Uterus*, are not only stopp'd by cold Bathing, but the Return prevented. Nothing more certainly gives Ease and effectually promotes the passing of Stones in a *Nephritic* Fit, than warm Bathing. And (r) *Baglivi* tells us, That *Dolor Colicus fere semper mitescit in Semicupio*.

Bathing will always act the Part of a *Diuretic*. And plunging over the Head in cold Water, especially in *Sea Water*, will do more in the Cure of Melancholy, Madness, and particularly of that occasioned by the Bite of a mad Dog, than any other Medicine. There is nothing more adapted to the Cure of *Frigidity*, when owing to a former Excess of *Venery*, than the Cold Bath.

It will also contribute its Share to the Cure, both of a simple *Gonorrhœa*, and *Fluor Albus*. 'Tis often successful in a *Palsy*, and they who use it much are very little affected with the Change of

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(r) De Praxi Medica, p. 70.

Weather; and yet the Abuse of Bathing is very prejudicial; for Bath-guides are generally of a pale and ghastly Countenance, of a bloated Habit of Body, with ulcerated and swell'd Legs, which often ends in a *Dropfy*.

§ 4. Tho' Bathing hath been us'd with Advantage in all the Cases I've mention'd; yet there is scarce any of 'em all, but in some Circumstances it would be prejudicial: So that to reap the best Advantage we can by reading the History of Cures perform'd by it, it is fit we should enquire what Alterations are made by it in a Human Body, that so we may know in what Conditions to order it, and what not.

§ 5. I've already observ'd, That our Bodies are press'd upon by a Weight of *Air*, when the *Mercury* stands highest in the *Barometer*, equal to 39900 Pounds *Troy*. Now if this Weight be either considerably increas'd or lessen'd, as 'tis often upon the Change of Weather, and the Influence of the *Planets*, it will certainly make a great Alteration in the Fluids of our Bodies, as I have proved before; But this Pressure is never so much augmented as when we Bathe ourselves: For *Water* being above 800 times



heavier than *Air*, must needs greatly increase the Pressure; and a Body sunk 35 Foot in Water, sustains double the Weight it does in the Air; and though when we are near the Top, the Pressure upon our Bodies is mightily lessen'd, yet 'tis much greater than in the open Air; so that all the Consequents of a greater Pressure will happen upon Bathing.

The tender *Fibrille*, of which the Skin is compos'd, being unequal in Strength and Tensity, some of 'em will more resist the Pressure of the Water than others; from whence proceeds that *Rugosity* of the Skin upon Bathing.

§ 6. 'Tis certain that the Surface of the Body, and those Parts adjoining to it, will be the most and first compress'd, and those at the Center the least and latest; so that the Blood will be forced in great Plenty upon the *Viscera*, where there is the least resistance: For this Reason, it is never safe for those to Bathe who have weak or ulcerated Bowels; nor can they, without Danger of Life, or Swooning at least, who have a very weak Pulse, enter into a Cold Bath. The 4th *Aphorism* in the 3d §. is only accounted for this way, viz. *That cold Bathing heats robust Bodies, and refrigerates*

*rates weak Ones:* For the Contraction of the Heart in robust Bodies being strong, makes the greater Conflict with the resistance it meets with in promoting the Circulation of the Blood in such as enter the Cold Bath; whereby the Blood is more broken, and the hot Particles set at Liberty, On the contrary, in those who are weak, the Contraction of the Heart is but just able to continue the Blood in its Circulation, which will, by Reason of the Resistance it meets with, be slower than before, and therefore they will have a Sense of Cold, or be refrigerated.

§ 7. One that goes into a Cold Bath, if he plunge not himself over-Head, is subject to the Head-ach; the Reason of this is plain, from what I have observ'd before; for there being the least Resistance to the circulating Blood in the Head, which is press'd upon only by the Weight of the Air, it will run in such Plenty thither, as to distend the Vessels beyond their usual Tone, and thereby occasion a Sense of Pain. And why People are so chearful, brisk and lively after Bathing, is not only because the perspirable Matter is thrown off more plentifully, (according to *Sanctorius's*

*Etorius's* Observations (s) viz. *Melancholy* is overcome by a free *Perspiration*, and (t) *Chearfulness*, without an evident Cause, proceeds from *Perspiration* succeeding well) but also from a Sense of less Weight upon the Body. A Person two Foot under Water (as they often are who use Bathing) sustains a Weight of Water added to that of Air (supposing still the *Area* of his Skin to be equal to 15 square Feet) equal to 2280 Pounds for 2, the Number of cubical Feet of Water pressing upon a Foot square of the Skin  $\times 76$ , the Number of Pounds in a cubical Foot of Water is  $= 152 \times 15$ , the suppos'd Number of square Feet on the Surface of the Body is  $= 2280$  Pound Troy.

§ 8. So that the first and most obvious Consequence of Bathing, is by a greater Pressure upon our Bodies to straiten the Vessels, and thereby dissolve the Humors, and make 'em fitter to pass the Glands to be evacuated, as also to squeeze out any viscid obstructing Matter that sticks to the Sides of the Vessels, and renders the Motion of the

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(s) *Aphor.* 17. § 7.

(t) *Aphor.* 23. § 7.



Fluids of our Bodies more free and easy. In the next Place, they who enter into the Bath, have the Quantity of their Blood mightily increas'd in the *Brain* and *Viscera*, being forc'd thither, where there is the least Resistance; and the Quantity of separated Matter in any Gland, being as the Quantity of Blood multiply'd, into its Celerity at the respective Glands, (u) the Quantity of *animal Spirits*, of *Urine*, of *Gall*, *Succus Pancreatis*, &c. will be mightily increased, and any Impediment to the Secretion of these Fluids, will probably be removed, these Liquors flowing with a greater Celerity. So that,

1. If we wou'd have the Blood dissolv'd; 2. or any viscid Matter adhering to the Sides of the Vessels remov'd; 3. or the Glands scour'd; 4. or a greater Quantity of Spirits generated and moved with greater Celerity through the Nerves; 5. or wou'd force Urine; 6. or remove Obstructions in the *Liver*, *Spleen*, *Pancreas* and *Mesentery*, if they be not grown too obstinate, (in which Case 'tis dangerous) we ought to order Bathing.

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(u) Pro. 17. Of *Animal Secretion*.

It is for the 1st, 2d, and 3d Reason, that it cures the *Itch*, *Leprosy* and *Elephantiasis*; it is for the 4th Reason, together with the former, that it cures the *Palsy*, *Melancholy*, *Madness*, and the Bite of a *mad Dog*; it is for the 5th, that it helps the Passage of Gravel; for the 6th, join'd with the other, that it helps *Cachectic*, *Icteric*, and *Hydropic* People, before the Distempers be too far advanced.

§ 9. These Ends, which are compass'd by a greater Pressure, are more effectually obtain'd by whatever increaseth the Weight of the Water, or contracts the Fibres of our Bodies; it is the Salt in the Sea-Water, whereby its Weight is increas'd, that makes it more useful in the Cure of those who are bit with a mad Dog; and the deeper you plunge 'em, the more effectual will it be, for a Reason that I have given before.

We know by Experience, that Cold contracts, and the more suddenly it is apply'd to our Bodies, the more violently it operates; but how much it contributes to the obtaining of the forementioned Ends we cannot certainly know, having no Rule, by which we may measure the Quantity of Contraction caused by it.

But

But that it is very considerable, we need not doubt, having so many Experiments to prove it. The Contraction of the Fibres is propagated throughout the whole Body, upon which Score all the Humors in the Body must be propell'd with greater Force through the Vessels, in which they circulate; besides that the Tensity of the Fibres being greater, their Vibration will both be quicker and stronger, (and that in Proportion to their increased Tensity) so that the Blood and Spirits will not only move more swiftly through the Canals, but also be extremely ground and broken; from whence all the Effects of more fluid Blood and Spirits, moving with greater Velocity, will necessarily ensue upon using the Cold Bath. These Things, which I've said, compar'd with the Constitution of the Patient to whom Bathing is prescrib'd, will give you the Time he ought to stay in it, the Number of Times, (with the Intervals between them) he ought to use it, the necessary Preparations for it, and what is to be done after it.

It is upon the Account of the contracting Power of the Cold Bath principally, that it stops *Hæmorrhages*, *Gonorrhœas* and



and the *Fluor Albus*, as also that it cures *venereal Impotency*.

Where the peccant Matter hath been made more fluxil, either by Medicines, Diet, or a regular Use of the Warm or Temperate Bath, in chronical *Rheumatisms*, *Gout*, *Sciatica*, *Lamenefs*, &c. the violent contracting Power of the Cold Bath will often perfect the Cure. A *Nervous Atrophy*, which (w) *Baglivi* probably conjectures to be owing to an universal Relaxation of the Nerves which terminate in the Skin, is as likely to yield to the Cold Bath, as any other Method, provided the Pores, by Contraction, were not shut up too suddenly; for it would then throw the detained Matter upon some other Glands, whereby an Evacuation more dangerous might succeed.

§ 10. The next Property of the Bath, distinct from its Weight and Coldness, depends upon its being *moist*; and by this Quality of the Water, it softens, relaxes, and makes pliable all the Parts of our Body, as sufficiently appears by steeping any Part of an Animal Body in Water,

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(w) De Fibra Motrice & Morbosa, p. 67.

even the Horns and Hoofs of Beasts will become soft and flexible, by a long Im-  
mersion in Water, especially if warm.

And that Water, as moist, hath a Pro-  
perty of relaxing, as 'tis prov'd by Ex-  
periment, so 'tis no Way inconsistent  
with what I've said of the Pressure of  
Water in general, nor the contracting  
Force of the Cold Bath in particular,  
the Pressure of the Water is consistent  
enough with relaxing and softning of  
Bodies that are immers'd in it; for the  
Weight of the Water will enable it to  
insinuate itself into the Pores of the  
immersed Body, whereby it will become  
more soft and flexible; and yet, before it  
hath done this, will force together the  
Sides of any yielding Vessel, such as those  
of a humane Body are, and thereby  
press out their Contents with a Velocity  
proportionable to the Weight incumbent  
on 'em: So that, after the Humors have  
been put in violent Motion by the Pres-  
sure of Bath-Water, if the Person stay  
any considerable Time in, he will have  
the solid Parts of his Body softned, re-  
lax'd and made flexible. This Hint is  
of great Use to determine the Time our  
Patients ought to stay in the Bath, in  
some Distempers more than others.

Now

Now I shall enquire, how the contracting Power of Cold, and the relaxing Power of Moisture can agree in the same Subject : That they cannot act intensely at the same Time, but their Actions will destroy the Effect one of another, is evident to any who consider, that contrary Qualities are inconsistent in the same Subject, at the same Time ; but, as I observed in the last Section, Moisture acts very slowly, and must be a long Time in performing its Work, whereas Cold acts quickly and on a sudden, as we know by a Multitude of Experiments : Wherefore, tho' the Cold Bath may contract at first, yet, by staying too long in it, it would relax ; but there are none, who are able to bear the Cold so long as to produce the latter Effect. The principal Reason, why Cold so violently contracts the Membranes of our Bodies, is by making an ungrateful Sensation ; for such is the Frame and Constitution of the Animal Oeconomy, that the Soul has a Power of contracting, or relaxing the Membranes, and Vessels of the Body, so as best to serve the Purposes of Life ; and tho' we know not how the Soul operates upon the Body, yet would it be the greatest Folly, to deny that which we daily experience



ence to be true : We every Day observe, by the Command of our Wills, that the Members of our Bodies are mov'd a Thousand different Ways, and 'tis as easy to imagine the Soul acts immediately upon the Nerves, and other solid Parts of the Body, as upon the animal Spirits, being that Spirit can act as easily upon solid Matter, as that which is fluid ; the Mode of its operating being altogether unknown to us. In a relax'd State the Body is weak, feeble and unactive, and in this Condition it is in all the Passions which are attended with Pleasure : On the contrary, whatever Passions of the Mind are attended with Pain, Grief, or any Kind of Uneasiness, as Malice, Revenge, Fear, a Fright or Surprize, puts the whole Body into a contracted State, as appears by the Shrinking the Veins, Sparkling of the Eyes, Contraction of the Pupil, Paleness of the Face, and especially of the Lips ; and this is none of the meanest Displays of infinite Wisdom and Goodness, for the Preservation of Man : For by this Means he is strongest when he has the most Occasion for it, either in resisting Force, when he thinks he can overcome it, or else in flying from it ; in doing of which upon a

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Fright,

Fright, some have exerted such Agility of Body as is almost past Credit, were it not the common Observation of Mankind, how vigorous and active we are in such Circumstances. The Reason of this excessive Strength, when the Vessels of the Body are contracted, is evident from Dr. *Cheyne's* Proposition about the Strength of Animals, (*viz.*) ' That 'tis ' in a triplicate Proportion to the Quantity of Blood running in the Vessels: Now the Quantity of Blood is mightily increas'd, in the Proportion it bears to its Vessels, when they are contracted, to what it is when relaxed; for 'tis the same Thing to all Intents and Purposes, whether the Vessels continue of the same Wideness, and the Quantity of Blood be increas'd, or the Quantity of Blood continue the same, and the Vessels, in which it runs, be straitned or contracted; so that we may expect the same Strength in an Animal, whose Vessels are contracted to half their Wideness, as we may from an Animal, whose Vessels are in their former Condition, and the Quantity of his Blood doubled; so that, besides the Advantages common to all Sorts of Bathing, there is this peculiar in the *Cold Bath*, That  
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it gives a violent and universal Contraction to all the Membranes and Vessels of the Body; and there is nothing so surprising in the sudden Cures it performs, but what is accountable from this Cause.

§ 11. But Water hath certainly a softening, relaxing Property, when apply'd to our Bodies, and by Means of this, 'tis able to bring about great Alterations; and as the Pressure of the Water is made more effectual by Cold, so is its relaxing Power by a moderate Warmth: For a gentle Heat always relaxes the Fibres of our Body, by being pleasing and agreeable to the Sense of Feeling: So that, when we would have the Benefit of an universal Relaxation, we ought to go into the Temperate Bath, such as *Buxton*, being the most temperate of any that I know of in *England*. The first Advantage, that many receive from the Use of this Bath, is an entire Refreshment after Weariness with a Journey, 'Tis a common Custom for Persons wearied with Riding, as soon as they alight, to go into the Bath for a little Time, by which Means they become as lively and brisk, as they were in the Morning: For Weariness being nothing but an Overstretching, or too great a Tensity of the

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Fibres,



Fibres, occasion'd by using them too long or too violently, must, upon their being relax'd, go off again : 'Tis for the same Reason that Sleep takes off Weariness.

§ 12. This universal Relaxation caus'd by Bathing will so widen the Pores, that a vast Quantity of perspirable Matter will be carry'd off, more than at another Time. 'Tis for this Reason that some corpulent People have, in a Fort-nights Time, lost above two Stone Weight by using of this Bath ; and all the Advantages of a free Perspiration may be gain'd this Way, tho' it be true, we are more obnoxious to catch Cold afterwards ; Yet, I think, a cautious Use of the *Cold Bath* after the *Hot* might not only prevent that Inconveniency, but, in many Cases, render it much more beneficial. I've known that Bath I am speaking of to remove violent Pains in the Head, Back and Joints. A Gentleman of my Acquaintance had a fixed Pain in his Breast for almost two Years, and was reliev'd by four or five Times bathing in this Bath. It helps a chronical *Rheumatism*, *Gout*, and the *Cholick*, *Lameness*, *Contraction* of the *Tendons*, &c. and how all these are perform'd, is easily known by the foregoing Theory. But,

§ 13.

§ 13. All the Effects of warm Bathing are better brought about by the Water insinuating itself into the Body thro' the Skin, for being mixed with the Blood, it doth dilute and dissolve the Acrid Salts in the *Serum*, by which they are better carried off, thro' the proper Glands design'd for their Evacuation: So that 'tis useful in all Distempers, where too much *Salt* abounds, as the *Scurvy*, and most *Cutaneous Diseases*.

Tho' it be a general receiv'd Notion, that Bath Water enters into the Body, and so mixes itself with the Blood, yet most believe it upon very indifferent Grounds, or having never examin'd the Reason of the Thing, nor consider'd the Objections against it. That Water hath a wonderful Power of insinuating itself into any contiguous Body, appears from several Experiments. We see how Deal Boards will swell against Rainy Weather, the Watry Particles floating in the Air, by the Pressure of the Air upon 'em, are forced into the slender Tubes of the Wood, where they meet with no Resistance, the Particles of Air being too large to enter the same: It is certain, however true the contrary may appear to be, that the

compounding Particles of Water are less than those of Air, being the former will pass thro' several Bodies, that the other will not. It will force itself thro' the Skins of Animals, even after they are dry'd and converted into Leather. (x) *Bellini* try'd the Experiment upon the Skin of a Man's Head, which, after it was moderately dry'd, suspended it with a Stone in it, to sink it in the Water, and in a few Hours Time the Water had forced its Passage thro' it: But nothing shews more the Force of Water to enter into contiguous Bodies, than the following Experiment.

Fasten a Piece of Whipcord, or a strong Rope, of what Length you please, (but the longer, the more visible will the Experiment be) to a Hook, or Staple, and at the Bottom of the Cord hang any Weight short of what will break it, tho' never so great: You will find, that the Weight will rise in moist Weather, and sink lower in the dry: You may also raise the Weight by moistning the Sides of the Cord with a wet Sponge; by this Means a few Particles of Water may overcome any finite Re-

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(x) *De Urinis & Pulsib.* p. 146.



sistance, if the Cord would bear it. Now, since there is but a little Quantity of Water, and that driven into the Sides of the Cord, with a Force no greater than the Weight of a Cylinder of Air incumbent upon the Water; therefore must the Water act by some Property, whereby its Force is greatly augmented, and that can be no other than that of the *Cuneus*; and the Forces of Wedges are to one another reciprocally proportional to the Angles their Edges make; but in Spheres, the greater or lesser Degree of Curvity is to be consider'd as their Angles, when Spheres are consider'd as Wedges; and the Degrees of Curvity in Spheres are reciprocally as their *Radii*. Now the Particles of Water being so infinitely small, less by much than those of Air, must, when acting as Wedges, have their Powers infinitely increased, so as to overcome any finite Resistance: Now, let the Resistance the Water meets with, in entering into our Bodies, be what it will, yet 'tis hard to believe it's greater than what I've mention'd, which yet a little Quantity of Water will overcome. The Experiments I have taken Notice of, were made upon the Skins of dead

Men, or Beasts, which would have put the Matter beyond Dispute, had they been made upon such as were alive. The only Difference then being, that, in the Living, Steams or Vapours are constantly raised into the Air, through the Pores of the Skin, in insensible Perspiration; which is not so in those that are dead. These Vapours, tho' raised with a considerable Force, are yet unable to withstand the *Impetus*, with which Water endeavours to insinuate itself into contiguous Bodies, being so great as I have explain'd. And tho' the Quantity of perspirable Matter is very great in 24 Hours, being (y)  $\frac{5}{8}$  of the Meat and Drink a Man takes in a Day; yet, if we compute the Quantity that perspires from any Part of the Skin, in a given Time, we shall find it too little by far to hinder the Entrance of Water into the Body, when we go into a Bath. For Dr. *Pitcarne* (z) hath demonstrated, that the Matter of insensible Perspiration in a Minute is the 1200th Part of the Place it comes from, (*viz.*)  $\frac{1}{1200}$  of the

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(y) *Sanctorii Medicin. Stat. Aphor. 6, § 1.*

(z) *Dissertationes Medicæ, P. 130.*

Skin perspires  $\frac{1}{1200}$  3 in a Minute, and consequently 3i of the Skin perspires  $\frac{1}{1200}$  3 in a Minute, now, suppose a square Inch of the Skin weigh 3i, then a square Inch perspires  $\frac{1}{1200}$  3 in a Minute; but a square Inch of the Skin is pressed upon by a Weight when we bathe, more than in the open Air, equal to 96 Drams. For we may conclude, that our Bodies, taking one Part with another, are two Foot under Water, when we bathe our selves: So that every square Inch of our Skin must bear the Weight of 24 Cubical Inches of Water, equal to 96 Drams: For a cubical Inch of Water being 3iiii  $\frac{384}{1728}$ , throwing away the Fraction, 24 cubical Inches must be 96 Drams: Now, since only the  $\frac{1}{1200}$  3 of Matter is perspired through a square Inch of the Skin in a Minute, therefore is the Elevation of the perspirable Matter resisted by a Weight 115200 times greater than it self; for  $1200 \times 96 = 115200$ . How great then must be the Celerity with which the perspirable Matter moves, if we imagine it able to raise a Body 115200 Times heavier than it self? Thus would it be, if the whole Quantity of perspirable Matter evacuated in a Minute,

was



was to exert its force at once upon the incumbent Weight of Water; but it is so far from doing that, that if the Exhalation of the Streams be not continual, as the Pressure of the Water is, yet the Intervals betwixt the Times they are propell'd from the Body are very short; suppose 60 of them in a Minute, being about the Number of Pulses that a healthful Man's Artery beats in the same time: Then will the Quantity of Vapour, which exerts its force at once against the incumbent Water, be sixty times less than what I first assign'd; which being multiplied by  $1200 = 72000$ , the number of Parts into which a Dram of perspirable Matter is divided, one part only of which exerts its force against 96 Drams of Water in a Second: So that the perspirable Matter that rises every Second, must raise a Weight 6912000 times greater than its self, if it resist the Entrance of the incumbent Water; for 96 the number of Drams of Water, incumbent upon an Inch square on the Skin, multiplied by 72000, the number of Parts into which a Dram of perspirable Matter is divided, is = 6912000 the Difference between the Quantity of Matter perspired in a Second,

cond, and the Quantity of Water by which its Motion is resisted.

I think by this Time it sufficiently appears, that the Bath Water will mix itself with the Humors of the Body, so that there is nothing so wonderful in Bathing, but what may be accounted for from some of these Properties of Water I've mention'd, without having Recourse to the Salts with which Bath Waters are impregnated; which yet may contribute their Share in the Cure of some Distempers. What I've said about Bathing, as 'tis mostly new, so are my Reasonings founded upon known Experiments; and how just my Inferences from 'em are, I leave to the Judgment of my Reader (supposing him to have the necessary Qualifications, and a moderate Attention) to determine.

§ 14. To apply the general Proposition, *viz.* That Bath-Waters act upon a Humane Body by their Weight, (by contracting or relaxing the solid Parts, and diluting the Fluids of the Body) in all Distempers wherein Bathing might be beneficial, or injurious, wou'd take me up more Time than I've now to spare, tho' I may, perhaps, find a more seasonable Opportunity of doing it.

Of

## Of wearing Flannel.

I shall now, according to my Promise, say something concerning the wearing of Flannel. By what Fate so many of late fall in with an Opinion of the Advantage of wearing it, I can't tell; but this I'm well satisfied of, that it does Hurt to two for one that receives Benefit from it, and there is none to whom Flannel is more prejudicial than those to whom 'tis generally prescrib'd, being weak, faint, or hectic People; indeed it must be confess'd that there are some that receive Benefit by it, but they are very few, and I question not, but some ascribe that to Flannel, which is owing to some other Cause unknown, and which had perform'd the Cure both more speedily and perfectly, had the Person never us'd it.

A Man of a robust Constitution, who eats and drinks well, and yet uses not Exercise enough to throw off the Remains and Dregs of a full and nourishing Diet, and who is subject to *Defluxions*, *Catarrhs*, *Pains* in the *Joints*, and such Distempers, as are owing to a *Plethora*, will receive Benefit by wearing



ing Flannel, tho' too long an Use of it may so relax the Tone of the Fibres of the Skin, as to hinder that Perspiration which before it help'd: For tho' the Quantity of perspirable Matter be in Proportion to the Wideness of the Pores of the Skin, yet they are not the widest when the Skin is most relaxed, however 'tis necessary that the Skin be considerably relax'd, that the Pores may be increas'd to their greatest Diameter.

The most certain and constant Effect of wearing Flannel, is to make a more free and plentiful Perspiration, which tho' it be attended with great Advantages, (according to (t) *Sanctorius*) when moderate, yet, when excessive, nothing is more pernicious. The other Effects we observe from it, as they are more uncertain, so are they but the Consequences of this; now since the increasing of one Evacuation is the lessening of another, therefore whenever too much is thrown off from the Blood either by Stool, Urine, or Spittle, it may be proper to wear Flannel.

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(t) *Medicin. Statica. Apher. 10, 42, and 44. § 1.*

Both *Walthmeidt* (u) and *Baglivi* (w) observe that *Diarrhœa*'s, from immoderate Grief, are incurable; and that principally from a Suppression of Perspiration, Grief contracts the Skin, as all troublesome Passions of the Mind do; so that the perspirable Matter being retain'd, will be thrown upon some other Glands, and if on those of the *Intestines*, will continue a *Diarrhœa*. 'Tis also observ'd, that *Usus Veneris* makes the Body Costive, and this it does only by promoting Perspiration by an universal Relaxation of all the Fibres, which is always porportional to the Intenseness of the Pleasure; and for the same Reason 'tis, that weak Persons are subject to a Looseness in Winter (when the cold Air shuts up the Pores of the Skin) which they are free from in Summer. In a *Dysentery* the last mention'd Authors, above all Things, order the Body to be kept warm, and especially the Feet, to promote Perspiration; and the latter observes a Consent between the Skin and the Intestines, as *Hippocrates* did before him.

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(u) De *Diarrhœa* inter *Monita Medica*.

(w) De *Praxi Medica*, p. 76.

*Sanctorius*, in his 46 *Aphor.* § 1, tells us, That the perspirable Matter retain'd, neither being resolv'd by Nature nor a Fever supervening, disposes the Body presently to a malignant Fever. And *Dr. Cockburn* in his Treatise of the *Distempers of Seafaring-Men*, gives Instances enow of Fevers from a suppress'd Perspiration. In such Cases as this, whereby the preceeding Symptoms (as a Dejection of Appetite, spontaneous Lassitude, sudden Loss of Strength, a Stupidness, with Inclination to Sleep, the Want of usual Stools, &c.) a Fever is threatned, nothing will contribute more to prevent it, than restoring Perspiration to its wanted Freedom; and Flannel may very well act its Part in this Scene. But these Cases I have taken Notice of, are such as Flannel is seldom or never order'd in, tho' in these only, we may expect Advantage.

That it may appear how prejudicial Flannel is to those who perspire too much, as most weak People do, and to whom the wearing of Flannel, is generally prescrib'd, I shall observe from *Sanctorius*, That insensible Perspiration is double to all the sensible Evacuations made by Urine and Stool  
put



put together ; and that 'tis to that made by Stool as 40 to 4, (c) so that 'tis Ten Times greater than that by Stool ; therefore a Man will be made no weaker by having Ten Times as many Stools as he us'd to have, than he will be by perspiring only double the Quantity he does at other Times ; further, if we consider that the greatest Part of our Stools are the Remains of our Food that cou'd not enter the Lacteals, we shall find the Difference much greater ; for we can't imagine that above one Tenth of that we void by Stool, is evacuated from the Mass of Blood, by the *Liver*, *Pancreas*, and *Intestinal Glands* ; so that upon this Account there is as much deriv'd from the Mass of Blood in one Day by Perspiration, as by Stool in a 100 ; therefore if Perspiration by any Means be doubled, in 24 Hours it will make a Man as faint as if he had 100 Times more Stools in the same Time than usual. And there is none but who expect a Weakness from an unusual Purging, and we daily experience the sudden Danger of a *Diabetes*, wherein the Quantity of Urine

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(c) Medicin. Statica, Aphor. 59. § 1.

is increas'd, but take little Notice of an increas'd Perspiration, because *insensible*, for which Reason we are apt to ascribe the Mischief it occasions to some other Cause.

A Consumptive Gentlewoman in *Sheffield*, by the Advice of a Physician, putting on a Flannel Shift, tho' she was able very well to walk about the House, in two Days Time was confin'd to her Bed (from whence she never rose) without any other evident Cause than wearing Flannel.

If what I've said be of Force enough to persuade any to leave off wearing it, I wou'd advise 'em to do it in a warm Season, and at the same Time, either make use of the Cold Bath, or the *Flesh Brush*, which will prevent the Inconveniencies that otherwise wou'd attend it.

I was persuaded to wear Flannel next my Skin, above ten Years ago, for a severe Cough that I had got; by which, I think, I receiv'd some Advantage, but after I had worn it a Year or two, I found it very troublesome and prejudicial to my Health; it made me so exceeding tender, that I was not able to bear the least Cold; and

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I found by the Experiment of leaving it off, how much it dispos'd me to Faintness, which I mightily suspected before, and therefore I attempted several Times in Vain to get quit of it, but cou'd not without some Inconveniency, greater than I was willing to bear, till about two Years since, in a hot Season going into a Cold Bath, I left it off without any Damage.

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## C H A P. VIII.

*Of Meat.*

§ 1. **A**N Animal Body wou'd be little better than a Clod of Earth, were it not for the vast Variety of Action, 'tis enabled to perform, and this it does by Means of an infinite Number of small contractile Fibres, which in every Contraction and Distraction, which are Millions in a Day, by their Attrition one against another, file off from one another vast Numbers of little separable Parts, by which the Fibres daily grow weaker, and wou'd soon be unfit to perform their Function, were they not as constantly repair'd as they are diminish'd. And whenever the Fibres are in a State of Relaxation, their Pores being open'd, then are they in the fittest Condition to have new Matter by the Force of the circulating Humors impacted to them, and in this Condition are the Fibres when the Animal is asleep. So that as waking is the Time of spending, so is sleeping the Time of recruiting,

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ing; hence, by the by, we may observe the Necessity of Sleeping.

§ 2. Now 'tis our Food, whether Fluid or Solid, that furnishes us with this Supply, and all that is necessary to qualify it for this Purpose, is only that it be by the Force of the *Stomach* and *Lungs* divided into Parts small enough to enter the *Poruli* of the decay'd Fibres.

Hence we may deduce the Necessity both of taking in Food, and also of the Circulation of the Blood; for if either of these were wanting, there would be no Means left of repairing the Loss the Fibres sustain by their daily Contraction.

So that if a Man wou'd not destroy his Health, his Exercise shou'd be proportion'd both to his Eating and Sleeping: And Mr. *Fuller* in his *Medicina Gymnastica*, (tho' in other Respects it be an useful Book) is mightily out of the Way in prescribing Exercise, and that violent too, without any Distinction to all Sorts of People that can but bear it, nay, tho' they cannot without being extremely tir'd. I should have referr'd this to what I shall say about Exercise, but that it follows so naturally from what I have but just now advanced.

§ 3. Now

§ 3. Now that we might not neglect a Supply so necessary to the Preservation of our Body, the bountiful Author of our Being and Happiness, hath furnished us with two Appetities, the one to Solids, which is called *Hunger*, the other to Fluids, which is called *Thirst*; what they are is better known by Experience, than by the best Definition, and as they are a *Stimulus* to the gratifying of Nature's Cravings, so would they be the surest Guides both as to the Quantity and Quality of what we either Eat or Drink, were it not that most Men have vitiated and debauch'd them by Irregularity and Excess. Our Skill in the Animal Structure is not such as to determine exactly either the Quantity or Quality of what we take into the Stomach, so as best to answer the End of Eating and Drinking.

Tho' *Sanctorius* (a) gives a Rule to measure that Quantity of Food, which is best suited to our Health, *viz.* ' Observe in the Morning, after a somewhat plentiful Supper over Night, what the Perspiration in the Space of twelve Hours comes to, suppose it

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(a) Medicin. Stat. *Aphor.* 64. § 1.



‘ comes to fifty Ounces ; then another  
 ‘ Morning, after fasting over Night, but  
 ‘ with this Condition, that thou didst  
 ‘ not exceed at Dinner the Day before,  
 ‘ make the same Observation, as suppose  
 ‘ the Perspiration to have amounted  
 ‘ ed to twenty Ounces ; so having made  
 ‘ these Observations, pitch upon that  
 ‘ Proportion of Meat and other *Non-*  
 ‘ *Naturals*, as may reduce the Perspira-  
 ‘ tion to a Mean between fifty and twenty  
 ‘ Ounces, and that will be thirty five  
 ‘ Ounces, and that is the Quantity sought  
 ‘ for.’ This *Aphorism* is so far from  
 being an unerring Rule, that ’tis Faulty  
 in several Respects, for the same Quantity  
 of some Sorts of Meat and Drink, will  
 almost expel double the Quantity of perspirable  
 Matter, in the same Time, that  
 other Sorts will do it in.

In the next Place some Persons, in Order  
 to their Health, should perspire very freely,  
 and others more sparingly, according to  
 several of his own *Aphorisms* ; so that after  
 all, we must have Recourse to something  
 else as our Director, in this momentous  
 Affair, and that can be nothing but the  
 two recited Appetites, which as they direct  
 us in the Quantity, so should they be the  
 Measure

sure of what Quantity we either Eat or Drink. And in general so much may we Eat or Drink, till Hunger and Thirst be no longer troublesome to us ; for whenever we exceed these Bounds, we sow the Seeds of various Distempers ; but yet as *Hippocrates* (e) tells us, the Consequents of a slender Diet, are more fatal, than of one that is more plentiful, wherefore 'tis dangerous for one in Health to live of too spare Diet.

§ 4. It is not only in this State of Health we are so much oblig'd to our Appetites, but even in most Distempers ; were we to consult 'em, we should find 'em very good Guides, tho' not infalible. In *Inflammatory Fevers*, what is more desirable than cooling Liquors ? and in general nothing more beneficial. Or, what more detestable than *Cordials*, bitter *Alexipharmics*, and testacious *Powders*, such as *Coral*, *Pearl*, *Gascoine's Powder*, &c. and nothing more prejudicial ? In *Hypochondriacal* Cases the Appetite is oftentimes Voracious, and Thirst little or none at all : And nourishing Food in good Quantity is one of the best Remedies for this Distemper. And as their

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(e) *Aphor.* 5. § 1.

Drink is but little, so would they have it to be Strong and Spirituous, both advantageous to the Hypochondriacal. To produce all the Instances I could for the Confirmation of this Truth, wou'd be to give a History of most Distempers; but shall save myself the Labour, by appealing to the Experience of every Judicious Physician.

§ 5. Our Food is to be consider'd with Respect to its Quantity, its Quality, and the Times of taking it.

In the first Place, 'tis more safe to exceed a little in the Quantity, than to come short, as appears by the last recited *Aphorism* of *Hippocrates*, as also from several others of \* *Sanctorius*. And indeed the Damage of a more full Diet, is soon remedied either by Exercise, or gentle Evacuations, but the Decay of Strength, the natural Consequent of too spare a Diet, is not so easily repair'd.

I am not here pleading for Gluttony, that being attended with the worst of Consequents, only wish that what I've said may be a Caution to those, who from the various Histories they meet with, of

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\* Vid. *Aphor.* 15, 16, 32, 33, 40, and 44.



such as have lived a long Time, by a spare Diet, are inclin'd to set upon the like Practice; the Mischief of which I've more than once observ'd. And, in general, those Instances, as they are but few, so are they of such as liv'd unactive and solitary Lives, the waste of Spirits being but little, their Supply need but be answerable to it. Tho' People, who live of a spare Diet, are unfit for the Fatigue of Business, or any hard Labour; yet such People if their Exercise be not too great, live longer than those of a robust Constitution; and it is observ'd that Men of a pale Complexion, live longer than those who have one more florid, and with a low Pulse, than with one that is strong; the Reason is plain, for the Humors of the last Sort are more *Volatile*, and so more susceptible of any Impression from external Agents: Their Solids also being more tense and Rigid, will, upon all Occasions, make their Vibrations more quick and strong, and so dispose the Body to all Sorts of inflammatory Distempers; besides, being more subject to break by their greater Tensity, they will be liable to a more speedy Decay by their greater Motion.

§ 6. They, who use most Exercise, should eat and drink most plentifully, by § 1, which should therefore be a Caution to Men of a sedentary Life, how they indulge themselves either too much in Eating or Drinking, tho' when the *Meninges*, together with other Membranes, have been upon the Srtetch too long by intense and severe Study, a Glass of some spirituous Liquor, *ad Hilaritatem*, in pleasant Company, is so far from prejudicing the Health, that 'tis attended with great Advantages; for, besides the promoting Perspiration, which was suppress'd by the foregoing Study, the over-Tense Fibres are relax'd, and so capable of having that Loss repair'd they had sustain'd by a long continu'd Contraction.

§ 7. On the other Hand, Gentlemen, that indulge to the greatest Excess, both in Eating and Drinking, can use no better Antidote against the Inconveniences that otherwise wou'd attend 'em, than violent Exercise, if their Strength be such as can bear it, and for this Reason 'tis, that some Gentlemen Fox-hunters survive so many of their drinking Companions, who do not use the like Exercise, the Fibres being so mightily relax

lax'd, both by the Quantity and Spirituouſneſs of the Liquor they drink (for Drunkenneſs is attended with all the Signs of a general Relaxation, as Stammering in the Tongue, Staggering in the Limbs, Relaxation of the *Cornea*, Dilation of the *Pupil*, &c.) will diſpoſe the Body to *Dropsies*, the *Jaundice*, *Consumptions*, *Apoplexies*, *Palsies*, &c. (as appears by comparing the Theory of theſe Diſtempers with a general Relaxation) if theſe Conſequences be not prevented by reſtoring the Fibres to their former Tone again, which nothing is ſo likely to accompliſh as violent Exercise. I ſhall add no more to what I have ſaid on this Head, leſt I ſhould anticipate what I have to ſay in the Chapter of Exercise.

§ 8. *Hippocrates* (f) tells us, That the Aged require leſs Food than thoſe who are Younger, or in the Flower of their Age; and it was to the putting of this Obſervation in Practice, that the famous *Italian Cornaro* (yearly leſſening the Quantity of his Food as his Age advanced) imputes in a great Measure,

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(f) *Aphor.* 13. § 1.



both his Health and *Longevity*, being in good Health at the Age of 120.

The Healthful also require more Food than the Sickly, as the Strong do more than the Weak; for the more we nourish distemper'd Bodies, the more Damage we 'em (g), do and yet some Distempers do not only require a nourishing Diet, but that it should be administred in great Quantities too, if the Stomach will bear it, as the *Hypochondrical* Disease, a beginning *Dropfy*, and in all Cases, where the Pulse is preternaturally weak and slow, provided Exercise be not neglected at the same Time; a spare Diet is more proper, in *acute* Distempers, than *chronical*, and it must be most slender when the Disease is at his Height (h). So must it also be in the Paroxisms of intermitting (i). As to the Quantity, take the following Rules:

§ 9. The Quantity is always too much when it so distends the Stomach, as 1 ft, to cause Uneasiness, and then, by pressing upon the *Diaphragm*, and the descending Trunk of the *Arteria Magna*, and the

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(g) Hipocrat. *Aphor.* 10. § 2.

(h) *Aphor.* 8. § 1.

(i) *Aphor.* 11. § 1.

ascending Trunk of the *Vena Cava*, to give a Difficulty of Breathing, and obstruct the Passage of the Blood through these Vessels, and thereby forcing a greater Quantity than ordinary into the Head, so distends the Arteries, as in a great Measure to obstruct the Passage of the Spirits thro' the contiguous Nerves, by which the Man becomes listless and sleepy.

2. A Man in perfect Health ought always to rise from the Table with some Appetite.

3. If either the Body or Mind be less fit for Action after Eating, than before; that is, if the Man be less fit either for Labour or Study, he hath exceeded in the Quantity.

§ 10. Our Food, as to its Quality, is either from the animal or vegetable Kingdom, 'tis either more or less nourishing; either solid, or fluid, simple, or more compounded.

§ 11. That taken from animal Bodies seems best qualify'd for the recruiting of diminish'd Strength, and repairing the Loss our Fibres sustain by daily Motion, consisting of Parts which have heretofore been apply'd to the same Use: Whereas our vegetable Food must be converted

ed into Nourishment, by the proper Action of our own *Stomach* and *Lungs*, which are much weaker than those of diverse Animals we furnish our Tables with every Day; being the solid Parts of an Animal are the very Matter with which they were nourish'd, amass'd together, in a solid Form, and the Nourishment of an Animal is but a little Part of that vegetable Food he lives on, as appears by the vast Quantity of Excrements which are voided by such Creatures; therefore the same Quantity of Flesh-Meat affords much greater Nourishment than Vegetables do. That it does so, is confirm'd by this Observation, that all Animals which live upon Flesh-Meat, as they eat less, so are they much stronger, and oftentimes more sagacious.

If an *English* Man eat a Pound of Beef at a Meal, a *Dutch* Man, who mostly lives upon Vegetables, will eat two Pound of Cabbage or Turnip, and yet be no stronger, nor near so active as the *English* Man: Besides this, whatsoever is apply'd to any Part of our Body for Nourishment, must be of a Volatile Alkaline Nature, as is evident from various Experiments upon the Blood, all which shew it to be fraught with



with *Alkaly Salts*, whether it be in a sound or sickly State; for the Solution of *Sublimate* curdles the *Serum* white; Filings of *Copper* turns it, in a Day's Time *Caruleous*; *Syrup of Violets* and the Solution of *Turnesole* change it to a green, all Signs of a predominant *Alkaly*. A Distillation of the Fibres themselves afford an *Oyl*, *Volatile Spirits*, like that of *Hartshorn*, and *Volatile Salt*: So that, what Food soever is nearest allied to the Juices that nourish us, and affords the greatest Quantity of these Principles, is fittest for that Purpose. Now there is nothing bids so fair for this Character, as flesh Meat, Jellies, Broth, Soops, &c. all which afford a great Quantity of an oily *Alkaly*: On the contrary, vegetable Food, as it is more viscid, and so requires more Labour of the Stomach, to render the Parts of it so small as to enter the *Lacteals*; so is it stock'd with *acid* Particles, which must be converted into *Alkaly* by the Force of the *Stomach*, *Lungs* and *Heart*, before it be fit for Nourishment.

§ 12. *Bread*, as it is the most universal, so 'tis the most nourishing of any Sort of vegetable Food, and 'tis more or less so, according to the Grain  
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'tis made of, the different Way of preparing it, and the Time of keeping it before it be eaten. That made of Wheat is most nourishing, especially if it be well freed from the Bran; but then 'tis digested more difficultly, and inclines them that eat it to be costive; but if it be mix'd either with Rye or Bran, it loosens the Belly: Few Stomachs can digest it *unfermented*, tho' some hard Labourers constantly eat it so. The better our Bread is fermented, the easier it is to be digested, for a great Deal of that is done by Fermentation, which, otherwise, might have been done in the Stomach by *Trituration*; for, as Digestion is nothing else but the Reduction of our Food into Parts small enough to enter the *Lacteals*, so the Work of Fermentation is only an intimate Division of the fermenting Mass, whereby the *Cohesion* of its Parts is lessened, and so becomes less viscid, and easier converted into Chyle in the Stomach. 'Tis also more difficult to digest Bread that is new, than that which is a Day old, for the very same Reason, the new being much more viscid than the old; and 'tis upon this Account, Panado's and Puddings made of Bread agree better with weak Stomachs,

Stomachs, than such as are made of Meal. I think it proper enough, in this Place, to take Notice of the pernicious Practice of many, who feed their Children with Milk Pottage, boil'd till it be almost as glutinous as Syzing; 'tis no Wonder, that such Children have windy Distentions of the Belly, sometimes purge, and at other Times are constive, are troubled with the Gripes, and sometimes with Convulsions: Those Disorders are often better remov'd by an Alteration of their Diet, than by any Medicine.

The Grain-that is most in Use is Wheat, Rye, Barley, Oats, Pease and Beans, (Rice is seldom us'd among us, but on a physical Account, in Order to bind the Belly, but oftentimes very improperly, being so difficult to digest,) they only differ in their being easily or more difficultly digested, and in affording more or less Nourishment.

Wheat is preferable to the Rest, in both Respects, yet Rye, Oats and Barley are good Food, especially if well prepar'd; Pease and Beans are too viscid, whereby they become windy, and offend the Head and Stomach.

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This Sort of Food, except when it proves too windy, is proper for Persons of a robust Constitution, whose Fibres are too tense, and whose Blood abounds too much with Alkaly Salts, for they all afford, in Distillation, a considerable Quantity of Oil and Acid. Upon which Account, they are fit to soften and relax the over tense Fibres, and also blunt and correct the acrid, alkalious Salts in the Blood: So that 'tis very useful in the *Scurvy*, *Leprosy*, and most other *cutaneous Distempers*; 'tis also proper for those who are subject to inflammatory Distempers, as *Pleurisies*, *Rheumatisms*, or *Effervescences* of Blood, flushing *Heats* in the Face, or other Parts, the periodical *Asthma*, &c. Salads and Roots, of the cooling Sort, and sub-acid sweetish Fruit, which I need not name, being known to every Body, have pretty near the same Virtue, excepting that some of them are too flatulent to be used with Safety by Men of weak Stomachs.

The hot Salads and Roots are most proper in those Cases, where flesh Meat is beneficial; as 'tis in all Distempers where the Blood is too *serous*, the *Motion too slow*, and the Fibres too *lax*.

§ 13. I've known Preparations from Flesh, even in flow Fevers, more useful than the most generous Cordials the Shops could afford. The first Time I used 'em in this Case was upon myself, when, after I had been ten Days in a Fever, was seiz'd with such frequent fainting Fits, that my Life was in Hazard every Day, tho' I took a great Variety of Cordials, which always refresh'd me for the present, but their Force were soon spent, and my Fits return'd so often, that I was almost constantly drinking of my Cordials, till, after a Day or two, I resolv'd to try some good Chicken Broth, which, in little Quantities, agreed well enough with my Stomach, and relieved me much more than my former Cordials. This encourag'd me, my Faintness continuing, tho' not so dangerous, to have it stronger, till at last it was as strong as Mutton, Veal and Chicken, boil'd together, cou'd make it, and of those I took a Porringer every two Hours, for twenty Days together, which was so far from heating me, or causing any Uneasiness, that I complain'd of nothing during all that Time, but my excessive Weakness: Notwithstanding which, I

arose from my Bed every Morning, tho' with the utmost Difficulty; without doing this, I verily believe I had lost my Life, tho' I used all other rational Methods that were suggested to me. The Reason why lying too much in Bed in great Weakness is so prejudicial, I shall account for in a more proper Place; but shall, before I conclude this History, observe to you, that of all the Cordials I try'd during my Fever, nothing reliev'd me so much as the *Cortex*, neither were the Effects of any Cordial near so durable. This Success, immediately upon my Recovery, encourag'd me to try the same Method with a young Gentleman, who, by the Advice of one who understood very little of his Case, was, in two Days Time, twice blooded, vomited, purg'd, sweat and blister'd, which had so infeebl'd him, that he cou'd scarce speak, or turn him in his Bed; his Pulse was slow and exceeding weak, and sometimes intermitting; his Urine pale, his Tongue cover'd with a mucous Matter, yet not thirsty; and all this brought about in two Days Time: For when he was first seiz'd, his Fever was very acute, with all the suitable Symptoms of Thirst, Heat, Pain in the Head, &c,  
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by eating plentifully of good Broth, and the Interposition of some gentle Cordials, in a few Days Time he was freed from all his dangerous Symptoms, and after that treated suitably to his Distemper, of which he recover'd : But just upon his Recovery, was seiz'd with violent *pleuritic* Pains, and, I being out of Town, by the Advice of another, was twice blooded, and confin'd to Water-gruel ; by which Means, tho' his Pain was never a whit abated, his Strength was mightly diminish'd, his Pulse was soft, weak and slow, which, in a true *Pleurisy*, is always *hard* and *quick* ; therefore, guessing the Pain to be owing to the Viscidity of the Blood, and the Deficiency of the Spirits (whereby the Heart was disabled from contracting with that Force, which was necessary to carry on the Circulation, so that its difficult Passage through the Capillaries in the Breast was the Occasion of that Pain) rather than to either the too violent Motion of the Blood, or the too great Tensity of the Solids (which must rather have been in a lax Condition at the End of such a Fever) therefore, instead of pursuing the common Methods, I return'd him to his nourish-

ing Diet and Cordials again, by which Means, in a little Time his Pain was abated, and in twenty four Hours had quite left him, and then he recovered without any Relapse. I think those two Instances sufficient to show, that all the Ends of Medicine are not to be obtain'd only by the Use of *Drugs*; but if we would serve our Patients in their greatest Exigencies, we must sometimes tread an unbeaten Path, but never without a trusty Guide to direct us, *viz.* mathematical Reasoning founded upon uncontested Experiments. It is past Doubt with me, whatever some Physicians say against *Theory*, which they don't understand, that 'tis not only useful, but a necessary Qualification of a good Physician. For one that understands the Structure of a humane Body; the Nature of the Solids and Fluids; the Manner how animal Actions are performed; the Nature of *Secretion*; the Effect of either increasing or lessening any Evacuation; the known Laws of Motion, as apply'd to *Mechanics* and *Hydrostatics*, with the Application of 'em to the Alterations made in human Bodies, is, *Cæteris paribus*, better qualified for a Physician, than one who is ignorant of these Things,

Things, as too many, who bear a great Character in the World are, which, for Want of solid Reasoning, they maintain by a supercilious Look and affected Gravity; whose Word ought no sooner to be taken for the Safety of any Medicine they prescribe, (for the Prescription of which they can give no Reason) than that of a *Mountebank* upon his *Stage*, who will never fail of telling the People, how many Hundred he hath cured in all Distempers.

I wou'd not be mistaken in the foregoing History, as if I commended a nourishing Diet in all Fevers, whereas I think it dangerous in ten, to one wherein 'tis beneficial; and even in those where 'tis proper, 'tis not so in every *Stadium* of the Distemper. The more *acute* the Distemper, the more slender the Diet; and *Hippocrates* tells us, That a moist Diet is proper in all Fevers, especially for Children (*k*).

§ 14. It is a great Mistake to think, that the Stomach will always digest Food that is liquid, better than that

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(*k*) *Aphor.* 16. § 1.



which is solid, since it is contrary to daily Experience; tho' in general that Notion is true, but in many Distempers 'tis otherwise, nay, in the same Distemper, Liquids agree with one Man, and Solids with another: But to determine, when to prescribe the one or the other Sort of Food, besides the Patient's own Observation what is easiest to his Stomach, which is never to be slighted, this is the Rule: Whenever the Fibres of the Stomach are too lax, and its Cavity and Lining too much stuffed with a *viscid* Slime, then is solid Food more proper than that which is liquid. On the contrary, when the Fibres are too tense and springy, and the internal Coat of the Stomach robb'd of its slimy *Mucus*, then are Liquids more proper than Solids: The Pulse, the Urine, and especially the Spittle, give very probable Conjectures, in what Condition it is in those Respects.

§ 15. Tho' compounded Food be very delicious, and better fitted to gratify the Craving of a luxurious Appetite, and suit the Nicety of a weak or deprav'd one, for which Reason it may sometimes be allow'd; yet it is seldom or  
never

never so wholesome as that which is more simple, provided it be of easy Digestion, and afford good Nourishment. For the different Degrees of Cohesion there are, in the Ingredients of which *made Dishes* are compounded, must needs make the Digestion, or in other Words, the Dissolution of our Food into such Parts as are small enough to enter the *Lacteals*, more difficult.

§ 16. As to the Times of taking Food I shall consider 'em in respect to their Number in 24 Hours, and as to their Seasonableness.

§ 17. It is the Custom of some to eat once, some twice, and some three times a Day; now the Number of Times a Man shou'd eat in a Day is to be determin'd by the Age, Strength, Appetite, Quantity of Food he takes at a Time, its Quality as to its easy or hard Digestion; for the Young, the Weak, and those who take but little Quantities at a Time, of Food that is easily digested, should Eat oftner than those who are of full Age, Strong, of a voracious Appetite, who eat great Quantities at a Meal of Food, which is difficultly digested. Every Man ought to Eat so often as is necessary to supply the Loss he daily sustains

sustains, by the Motion of his Muscles; so that they who have little Appetites, shou'd use but little Exercise, or eat often; for if eating once a Day will not supply our daily Expende, we must eat twice, and if that be also be defective, we should eat three times a Day. The Signs of too long Abstinence are, after Hunger, a Faintness with a peculiar Uneasiness about the Heart-Pit, a low and stringy Pulse, a Weakness in the Joints, Inconstancy of the Mind, and if it be continu'd yet longer, will bring on dangerous Symptoms, as *Lypothymies*, *Vertigo's*, *Epilepsies*, &c. the last of these I observ'd to happen to a Gentleman, by too long Abstinence, join'd with Trouble of Mind, from his Misfortunes in the World; for as I was Riding with him at Five in the Afternoon, having eat nothing all that Day, and very little for some Days before, fell from his Horse in a violent Epileptic Fit, having never had one before in his Life, nor ever since, but once, upon the like Occasion; I got him into a House hard by, and by forcing some hot Ale into his Stomach, brought him out of his Fit, and then perswaded him to eat some Victuals, and drink a Glass or two of Ale



Ale after 'em, by which he was mightily refresh'd, and recover'd without any other Medicine. And indeed nothing is more proper in such a Case, whereby Abstinence, together with intense Thoughtfulness, all the Fibres of the Body were wonderfully contracted, and their *Elater* prodigiously increas'd, than what would cause a general Relaxation, as spirituous Liquors of all Sorts do, first in the Stomach, and then in the rest of the Body; so that Ale, for want of other Cordials, became an excellent Medicine.

§ 18. There are some who do not only repair their daily Loss, by one Meal in 24 Hours, but increase the Bulk of their Bodies to a vast Extent, as we may observe in some fat People; and I doubt not, but that 'tis best for such to eat seldom, for more Reasons than only to prevent their further Feeding.

§ 19. But in general, 'tis best to eat twice a Day, at such convenient Distances as that the Food taken at one Time may be digested before any more be eaten. In order to determine this Matter, I shall observe what happens upon eating plentifully, as also upon long Abstinence, even where the Stomach is not lost, but more voracious.

§ 20.

§ 20. Hunger, as all uneasy Passions do, puts all the Body into a contracted State, as Eating on the other Hand relaxes it, and the Relaxation is always proportionable to the Pleasure of Eating, and this in Proportion to the Hunger: So that those who fast till they be the most hungry, as their Vessels are hereby the most contracted, so will they upon Eating be the most relax'd; all Secretions being nearly suppress'd in the first Case, and mightily increased in second, (*by the 17th Proposition of Secretion*) the Vessels being more tense in severe Hunger, their Vibrations will be smarter, and Part of the Substance more easily worn off, and so dispose sooner to old Age; the Relaxation upon Eating being also greater than ordinary, would, in some Measure, compensate for the Loss, by giving Liberty for the Application of Nourishment to the worn Fibres, but that the Time is improper, the *Succus Nutritius* of the preceding Meal being all spent, and that of the present being yet in the Stomach, this Relaxation, tho' very great, will be of little Use.

'Tis certain, that upon this greater Relaxation, when the Stomach is cramb'd with

with Meat, 'tis less fit for Digestion; for the Force of the Stomach, upon a little, is greater than it is upon a greater Quantity of Food, and therefore a great Quantity is more difficultly digested than a little, and the Fibres being weaker, by Relaxation, is even unable to digest a moderate Quantity; and for this Reason it is, that a healthful Man ought to rise from his Table with some Appetite.

Thus the Digestion being weaker, the Chyle will be more viscid, the Motion of it through the *Duodenum* slower, and the Orifices of the *Lacteals* wider, by the supposed Relaxation; upon all which Accounts, a more viscid Chyle will be carry'd into the Mass of Blood, which generally requires more Labour to make it fluid, and fit for Nourishment, than they are able to bear who eat but once a Day.

This greater Quantity of Food, when 'tis well warm'd in the Stomach, will swell and rarify itself, and that the more too, because the relax'd Fibres of the Stomach are not able to resist it, and so cause a windy Distention of the Stomach with some Uneasiness at least; whereby Perspiration is suppress'd as well



well as by an empty Stomach (*l*), which is more or less inconvenient, tho' Custom may make it undiscernable : For I know several who eat but once a Day without any apparent Prejudice, which yet may be the Means of shortning their Lives, tho' it seems not in the least to impair their Healths at present.

Besides this, a great Quantity of Chyle being poured into the Mass of Blood at once, and that but seldom, must needs make a great Alteration in the Body, and put the Instruments of *Sanguification* more upon the Stretch, than when a little Quantity is poured in more frequently.

§ 21. I have observ'd before, that the Times of Eating ought to be such, that the former Food may be digested before more be eaten, and it should be also at such Distance from Bed-time, that Digestion be nearly finish'd before we sleep ; for the Preparation of our Food, by the Stomach, and the Application of it, to nourish the Body, are Actions so vastly different, that they are inconsistent one with another. Digestion is perform'd by Contraction, as Nutrition is

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(*l*) Vid. Sanctior. *Aphor.* § 3.

by Relaxation, so that the Food shou'd be digested before the Fibres be relax'd, in order to their Nourishment; besides, sleeping immediately after Eating, as it makes a more viscid Chyle, so does it derive more of it than ordinary into the Mass of Blood, thro' the enlarg'd Orifices of the *Lacteals*, and consequently produces all the ill Effects that we may expect from the Blood when too viscid.

§ 22. As to the most seasonable Times of Eating in general, they are about three Hours after rising in the Morning, and four or five before going Bed, as appears by comparing several *Aphorisms* of *Sanctorius*, viz. 57, § 1. the 20, 28, and 35, § 4.

The Body, upon waking, being put into a contracted State, if there be any Remains of the last Meal, either undigested in the Stomach, or not sufficiently attenuated in the Veins and Arteries, or adhering to the Orifices of the excretory Vessels, will, if not disturb'd by Eating or Drinking, so increase the Celerity of the Blood's Motion, and the vibrating Force of all the Vessels, as both to digest the remaining Food, attenuate that which is too viscid, and expel that which lies at the Orifices of the Glands.

Glands. And when these Ends are once compass'd, then 'tis the fittest Time to eat again, and this commonly happens between three and four Hours after rising, Perspiration (being the most plentiful two Hours after Sleeping, by the last *Aphorism*) ought by no Means to be diverted by Eating; so that we ought not to eat till after this Time, according to my Assertion, tho' 'tis true, that the Difference of Constitutions, together with the different Way of living some have from others, make some Alteration in this Respect.

If we go to Bed before our Meat be digested, the Stomach will be disturb'd in the Performance of its Orifice, by that general Relaxation that will happen upon Sleeping, and all the ill Consequents taken Notice of in the last § will ensue.

The Times of Eating should be different to those that drink a Bottle every Night; for their Victuals ought nearly to be digested before they drink, or else their Suppers ought to be very flight, and of such Food as easily digests, and yet solid rather than what is liquid; for a Reason I have more than once given in this Chapter.

C H A P.



## C H A P. IX.

## Of Drink.

§ 1. **W**ATER is the principal Ingredient in all our Drinkables, and the purer or less mixed we find it either with Vegetable, Mineral, or Earthy Particles, the better it is. Its Purity is best known by its Transparency, its Fluxility, Insipidness, and Lightness; for there is no Mixture but what will alter it in some of these Respects, and as that Water is the wholesomest, which has the least Number of foreign Particles mix'd with it; so there is none but what has some, as appears from Dr. Woodward's Experiments upon Vegetation; and 'tis from this Mixture that 'tis liable to stink and decay upon its Stagnation; for these Particles being of different Gravities, will some subside, whilst other emerge, and by their contrary Motions so break and divide themselves, as some of 'em to become specifically lighter than the Air, and in their Elevation strike the Nostrils with an ungrateful Smell,

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which when spent in the Air, and the rest of the solid Matter that was contain'd in the Water settled in its proper Place, the Water becomes sweet again, as we know by Experience. Rain-Water is the freest from Mineral Particles, but well stock'd with Vegetable, which is the Reason that it so soon putrifies, otherwise it would be the most wholesome of any : But Spring-Water, tho' it be heavier than Rain-Water, yet being less apt to putrify, is certainly fitter for common Use, provided it will bear Soap, and the Fountain run with a strong Current.

Cor. 1. From what hath been said, it appears of what dangerous Consequence the *Stagnation* of our Waters wou'd be, and how kind Providence hath been to us by the *attractive* Force of the Sun and Moon, to make so violent an Agitation in the Sea-Water, twice in every twenty five Hours, as we observe upon the flowing of the Tides. And Tempests, tho' prejudicial to the Mariners, yet seems necessary for the better Obtainment of this End; for without Storms and Tides, the *Ocean* in a little Time wou'd be so corrupted, as both to poison the Fish, and also infect the Air, with such Quantities

tities of putrified *Effluvia*, as in a little Time would kill the Land Animals also.

*Cor. 2.* That our Water is fittest for Use, after it hath stood some Time in a cool Place to settle; the Earthy Mineral Particles will some of 'em fall to the Bottom of the Vessel, and the Water become more Clear and Light.

*Cor. 3.* That Water should not be much boil'd before Use, as many do for the making of Tea and Coffee, for tho' boiling may promote the Separation of any *Heterogenous* Matter from the Water, if it stand some while after to settle; yet by Evaporating the lightest, and therefore the best Part of it, what remains must be so much the worse, and most Water may be boil'd till it have a Saltish Taste.

§ 2. It is so necessary to our Subsistence, that we cou'd not live a Moment without it, 'tis this Element that furnisheth all the Fluid Part of our Humors, without which they could not circulate, and that dissolveth all the Salts in the Blood, whereby some are carried to their proper Places within the Body, and others to proper *Emunctories* for their Expulsion from it. It serves to prepare our Food, and then for a *Vehicle* to con-



vey both it and Medicines out of the Stomach into every little Meander of the Body, both for Health and Nourishment.

§ 3. *Milk, Ale, and Wine*, are nothing but certain Quantities, tho' in different Proportions, of *Salts, Sulphurs, and Earth*, swimming in pure Water; the Difference between *Fermented* and *Unfermented* Liquors consists in nothing but the different Proportion of the *Earthy* Particles, and Subtilty of the *Sulphureous* and *Saline* swimming in Water; for from *Muste* or the unfermented Juice of *Grapes*, or from a Decoction of *Malt* before Fermentation, may, by Distillation, be extracted great Quantities of Oil, and the *Caput Mortuum* will be considerably more than after Fermentation; but when by Fermentation (which is only a violent Agitation in any Liquor, whereby the *Cohesion* of the Parts is alter'd, and those which are too heavy to swim in the Liquor sunk to the Bottom, and such as are too light forced up to the Top,) the *Sulphureous* and *Saline* Parts are Volatiliz'd, that which before was Oil and essential Salt, now, upon Distillation, arises under the Form of Spirits, and Volatile Salt, so that Spirit is nothing but Oil and Salt subtiliz'd, or  
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whose Parts are exceedingly divided ; the Pungency of Spirits upon the Tongue is owing to the sharp Salts now set at Liberty, which were sheathed before in the Viscid Parts of the unfermented Liquor.

§ 4. In all Cases wherein too many Salts abound in the Blood, such as the *Itch*, *Scurvy*, *Leprosy*, &c. unfermented Liquors (if cautiously used) are the most proper, as they also are for such who are subject to *Inflammatory* Distempers, as *Pleurisies*, *Rheumatisms*, or the like. When we design to *Relax* by Water drinking, we should take it warm, if not hot, with the Infusion of some Drug or other in it, to increase its relaxing Virtue, such as the Roots of *Sarsa*, *China*, *Liquorice*, *Althæa*, &c. It may be mixed with Ingredients that will lessen its relaxing Property, such as *Coffee*, *Tea*, or any sort of bitter Herb ; for all Bitters contract the Fibres of the Stomach, for which Reason they are all accounted *Stomachics*.

§ 5. *Coffee* and *Tea* are now become the general Entertainment of the Ladies, and most People of Fashion drink great Quantities of them, and without doubt very often to their Prejudice. The Water is very prejudicial to some, as

the Bitterness of the *Coffee* and *Tea* is to others; for none who are of a lax Habit of Body can bear much Water drinking, nor of a robust and tense Habit many Bitters: So that they who will drink these Liquors, should both adapt the Strength and Quantity to their Constitutions.

Fat, Moist, Phlegmatick People, may drink their *Coffee* very strong, with an empty Stomach, without either Sugar, Milk, or Butter; for the more the Fibres are irritated by it, the more strongly will they contract, and thereby the Stomach will cleanse itself from all offensive and superfluous Phlegm, then being admitted into the Mass of Blood, will, by increasing its Motion, lessen its Humidity; it will also become an universal *Stimulus*, and so recover the Tone of the Fibres too much relaxed in such a Constitution. On the contrary, People of a lean, dry, choleric Constitution, should either totally abstain from it, or drink it weak, with Butter or Sugar, upon a full Stomach, for 'tis to Persons of this Constitution that it is so prejudicial, when they either take it too strong, or in too great Quantities. It dries their solid Parts, expends the *Serum* of the Blood, gives *Palpitations* of the Heart, Tremb-



Trembling of the Hands, a weak and cloudy Pulse, Oppression at the Breast, Syncopies, Asthma's, and Vapours; it prevents Sleep, and blackens the Teeth, and all this it doth by an active hot pungent Oil. It affords of this Oil, by distilling in a Retort, almost double the Quantity to either Wheat or Horse-Beans, for which Reason it cannot be counterfeited by either of them. *Coffee* yields two Ounces and a half and two Scruples of Oil, whereas the same Quantity of Wheat yields but an Ounce and six Drams, and Horse-Beans but an Ounce, three Drams and ten Grains.

§ 6. What I've said of *Coffee* is mostly applicable to *Tea*, saying that this makes not so strong an Irritation upon the Fibres as *Coffee* does; both are useful in such Cases where drying Decoctions of the Woods and Lime-Water are proper. *Tea* is useful in the Stone (m).

*Sanctorius* (n) tells us, That *drinking of Water hinders insensible Perspiration, but advances Sensible*. And this not only gives us a Hint in what Cases to use it,

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(m) Waldschmid, de Cal. Renum inter monita Medica.

Sydenham Opera universa, p. 526.

Baglivi de praxi Medica, p. 90.

(n) Aphor. 67. § 3.

and what not, but also lets us into the Knowledge of some of its more immediate Effects upon the Humors of our Bodies, for since an increas'd Perspiration is the Effect of an increas'd Celerity of the Blood's Motion, or an Enlargement of the Pores of the Skin (*by the 20th and 21st Proposition of Animal Secretion*) therefore a diminish'd Perspiration must be the Effect of a slower Motion in the Blood, or straiter Pores in the Skin: So that Water drinking is proper in *Fevers*, the *Ancients* giving as much as the Patient wou'd drink, as also in all Chronical Distempers in which there is an *Effervescence* of the Humors, such as the *Gout*, *Defluxions*, *Head-achs*, *Hysterical Illness*, *Falling Sickness*, *Dull Sight*, *Melancholy*, *Bilious*, *Hæmorrhages*, and *Putrifications of the Mouth* (o), as Sir John Floyer informs us. The same Author tells us, he hath often put by his *Asthmatic Fits* by drinking Water, and certainly nothing is less flatulent than Water, having less Air contain'd in its Pores than any other Liquor we usually drink, as *made Wines* almost of all sorts have the most; for which Reason they are so offensive to weak Stomachs; for being heated in the

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(o) *Treatise of Asthma*, p. 176.

Stomach, the *Air* contain'd in 'em unfolds its Spring, and forces its Way thro' its upper Orifice in belching, if the *Fibres* of the Stomach be not very strong. Besides this, this windy sort of Liquor conveys greater Quantities of *Air* into the Mass of Blood, which will so *rarify* and expand it, as to produce all those Disorders that Water drinking is so proper to prevent.

§ 7. Our common Spring Water wou'd perform many of the Cures done by Mineral Waters, cou'd they be taken in the same Quantity without any Inconvenience, being their Effects upon a humane Body are mostly such as are owing to some obvious Property in Water, such as *diluting* the Blood, *dissolving* its stimulating Salts, *curbing* its Motion, *abating* its Heat, *shutting* up the too patent Pores of the Skin, *scouring* the Stomach and Urinary Passages, &c. But great Quantities of Water would relax the *Fibres* of the Stomach, and spoil both Appetite and Digestion, were it not for the *Stipticity* of Mineral Ingredients, which gives those Waters an Advantage above others: Besides, their Salts may be a Means of carrying them further into the Habit of the Body, and enable



enable them better to open Obstructions than common Water would, and their Salts being *Vitriolic* in all these called *Chalybeats*, may give a better Consistence to the Blood, grown too lax in Hypochondriac and Scorbutic Bodies.

The great Advantage that *Bath Water* has, above others, in restoring the lost Appetites of old Debauchees, is owing to its actual Warmth, which makes it so agreeable to Stomachs accustomed to hot Liquors; its Heat makes it more agreeable in the Cholick, tho' the Cure is perform'd by what is common to other Waters, for Water-Drinkers are never troubled with this Distemper. I have known some cur'd by drinking Water, after all other Means they've try'd have prov'd unsuccessful, and upon their drinking fermented Liquors, their Pains have return'd, which they have cur'd again by repeating their former Experiment.

§ 8. The fermented Liquors commonly in Use in this Kingdom, are *Ale*, *Beer*, and *Wine*; and there is this common to 'em all, when they are thoroughly fermented, *viz.* That they Heat, Intoxicate, force Urine, assuage Hunger, excite Thirst, Stupify, and promote Perspiration, when taken in great Quantities.

ties. They are lighter, and less glutinous than either *Wort* or *Muske*. These afford more Oil and fix'd Salt by Distillation, both being in a great Measure turned into Spirits in the other; so that fermented Liquors contain a great deal of *Sal Volatile Oleosum* in them, by which they become agreeable to the Stomach, by making a gentle Titillation upon our sensible Fibres and Membranes, and cause an universal Relaxation through the whole *Animal System*. The Blood will, by this Means, have a great Impediment to its free Circulation removed, the Diameter of all the Arteries being enlarged, a larger Cylinder of Blood will pass through them without touching their Sides, from whence the resistance proceeds, the Arteries being Conical, and therefore will move with greater Celerity, and consequently increase the Quantity of perspirable Matter and Urine, (*by the 20th Proposition of Secretion*) as also Heat and Thirst, as I've proved in the Chapter of *Acute Distempers*. Hunger being an ungrateful Sensation, they abate that by making a pleasant one, and all the Symptoms of Drunkenness may be accounted for, from an universal Relaxation. Moreover, this *Sal Volatile Oleosum* of ferment-

fermented Liquors, entering into the Mass of Blood, dissolves, rarifies, and expands it, whereby all the forementioned Effects are more easily brought about; and when the Rarefaction is excessive great, the distended Arteries intercept the Passage of so many Spirits into the Heart, as to render it unable to contract itself, with Force enough to drive the circulating Blood to the Extremity of the Body; for which Reason, People that are very drunk are *pale*. From hence we may infer, not only the Safety but Necessity of Blood-letting in this Case, both when the Pulse is almost insensible, and the extreme Parts cold. In this drunken Condition a vast Quantity of Blood is thrown into the Brain, and those Parts nearest to the Heart, whereby the Tone of their Fibres are destroy'd, (especially if Drunkenness be often repeated) and become so weak, as not to be able to carry on the Circulation of the Humors; for which Reason hard Drinkers will be stupid, and subject to *Appoplexies*, *Palsies*, *Vertigo's*, Loss of *Memory*, Trembling of the *Hands*, Loss of *Appetite*, a bad *Digestion*, *Tumors* of the *Liver*, *Spleen*, or *Mesentery*; from whence proceed the *Jaundice* and *Dropsy*.



*Dropsy*, the common Fate of most great Drinkers. Now since these Distempers are the Effects of Drunkenness, and brought about after the Manner assign'd, we may hence learn what Sort of strong Drink is the safest to be drunk in great Quantities. It must be such as is clear and transparent, and has a dry Pungency upon the Tongue, by which Means it will best pass off by Urine and Perspiration. It should also be such as has the least relaxing Property; for which Reason the gentle *Stipticity* there is in *Claret*, renders it generally the most wholesome to be drunk plentifully of any strong Liquor whatsoever, the great Quantity of *Tartar* contain'd it, prevents it both from relaxing the Stomach, and rarifying the Blood, so much as other spirituous Liquors do.

Though Excess in strong Liquors be so prejudicial, yet the moderate Use of them are often of great Advantage; and certainly they are great Blessings to Mankind, in as much as they are so very useful in several Cases, when our Spirits are almost exhausted by violent Exercise, or hard Labour, or sunk by Pains, Sicknes, or Perturbation of Mind. How comforting is a Glass of some grateful spirituous Liquor?

quor? It blunts the Sense of Pain, exhilarates the drooping Spirits, banishes Melancholy, satisfies hunger, when Victuals are not to be had; 'tis useful in all Distempers where the *Pulse is low*, where the Blood abounds with Serum, where Perspiration is suppressed, and when the Passions of the Mind are violent; for which Reason the Hypochondriac, the Hydropic, and such who have newly taken Cold by a Suppression of Perspiration, ought to drink strong Drink in a moderate Quantity. Nay, 'tis beneficial in Fevers, where the Lowness of the Pulse, the Dejection of the Spirits, and the Coldness and Dryness of the Skin indicate it. Though it must be confess'd, that 'tis but few Cases in which a cool Regimen is not the most proper.

*Wine* is generally the most agreeable to the Stomach, of any Kind of fermented Liquor whatever, both on Account of its *Clearness*, and of the *Tartar* contained in it: *Tartar*, or some of its Preparations, being more grateful to the Stomach, in all its Disorders, than any other Medicine; for these Reasons it is that *French Wines*, especially those of *Burgundy* and *Champaign*, are preferable to those of *Portugal*, *Spain*, or any of the

the sweet Wines, except when we would drink them as a Cordial, in little Quantities. These last, tho' they taste much stronger, and oppress the Stomach, and disorder the Head more than the other, do yet afford much less Spirit by Distillation; their Fermentation being more imperfect, their oily Parts are unconverted into Spirits, which appears by distilling them; for they afford more Oil than the other, and 'tis this half fermented Oil that makes them more difficultly digested, more nourishing for the Body, and fitter for Men of a dry Constitution. 'Tis to such that Ale is more agreeable than Wine, being more soft, smooth, and slippery, and consequently more *nourishing*, and fitter to relax the too tense and dry Fibres in such a Constitution. But in general, the nearer our *Malt-Drink* approaches to the Nature of Wine, the better it is; therefore it shou'd be made of clear Water that will bear Soap, be well *Hopp'd*, that it may keep till all the gross viscid Parts are fallen to the Bottom of the Vessel. It should have a dry Taste, without Sourness, and be transparent, should sparkle in a Glass, but the smaller the Bubbles are the better. That *Hopping* of Drink is necessary, is evident from this, that without  
*Hops*



*Hops*, we must either drink our *Beer* and *Ale*, *new*, *ropy*, and half *fermented*, or else *old* and *stale*, both which are very prejudicial to our Health. Nay, *Hopp'd Drink* is beneficial even in the *Stone*, as I have oft experienc'd, tho' the common Opinion be against it. *Hops* are a grateful Bitter, and therefore a good Antidote against both *Stone* and *Gout*, according to the Observations of (p) *Sydenham* and (q) *Waldchmiedt*; and if they be not prejudicial in the *Stone*, there is few Cases in which they will be condemn'd. Tho' it must be own'd, that they, as well as all other Bitters, are improper for Persons of a *hot* and *choleric* Constitution.

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(p) *Opera Univerſa*, p. 418, 419 and 526.

(q) *De Calc. Ren. & Arth. inter. Monita Medica*.

( I )



A  
TREATISE  
OF THE  
LIVER, &c.



THE Liver may well be called a conglomerate Gland, as it is made up of several lesser Glands commodiously tied together, who empty themselves all into one common excretory Duct : It is seated

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ed in the uppermost part of the lower Belly, immediately under the Diaphragm in the right Hypochondrium, which it almost wholly fills, and from whence it is extended beyond the Cartilago Ensiformis over the right Side of the Stomach, towards the left Hypochondrium; and where, towards its Extremities, it becomes sensibly narrower, and thinner; thereby, upon Occasion, to give the more room to the Stomach in its Distensions.

Its gibbous or convex Side is contiguous to the Bustard, or short Ribs on the right Side; as also to a great part of the Diaphragm.

Its hollow or concave Superficies towards the left Side, covers the Pylorus and the upper part of the Stomach, and also a part of the Omentum; but by the Interposition



position of the Gall-bladder, which for the most part lies between the Liver and the Stomach, near the Pylorus, as shall afterwards be describ'd. On the right Side it is extended to the right Kidneys, and covers a part of the Colon, and also the whole Duodenum, and some parts of the Jejunum and Omentum.

The Liver in a sound Man standing upright, hangs down below the short Ribs, almost as far as the Navel. In morbid Livers, its Bounds are oftentimes much farther extended, both beneath the Navel, and towards the left Side, to the short Ribs.

When these Tumors proceed from Causes that equally diffuse themselves thro' the whole Substance of the Liver, and encrease this Bowel according to all its Dimensions, they may be easily

distinguish'd from those of the neighbouring Parts, upon Examination ; because they always carry along with them the Figure of the Liver.

The Liver is likewise incident to particular Tumors both in its concave and convex Side, where the Cause is not so universal, as to extend it self over the whole Liver.

Those in the concave Superficies, are not so plainly to be known, as when they happen in the convex Side ; but may be concluded from the unusual fullness and hardness in the right Hypochondrium (the Seat of the Liver) together with the outward Colour of the Skin, which is usual for those to have, that labour under a diseas'd Liver.

Those in the convex Side, are nearer and more superficial, and  
 † are

are easily to be come at ; which you may feel by your Hand, if you gently direct it along between the short Ribs, the Cartilago Ensiformis, and the Tumor.

These Tumors, as we have observ'd before, will be sometimes extended to the short Ribs of the left Side, which may impose upon the Incautious, who may take them for Tumours of the Spleen, but are distinguishable enough ; for they lie more superficially, and upon the Stomach, than those of the Spleen can ; unless in very extraordinary ones, which will plainly discover their Seat themselves by their unusual Bulk, by the extraordinary Distension and Weight in the left Side ; and lastly because those of the Spleen will appear much deeper than they can be.



The Ligaments which keep the Liver in its due Place and Situation, are chiefly three.

The first ties it to the Diaphragm, and is called *Ligamentum Suspensorium*; because by the Assistance of this the Liver is principally supported, which otherwise, by reason of its great Bulk and Weight, would in an upright Posture fall down lower than it should do.

This Ligament is not only barely fixt to the outward Membrane of the Liver, but enters its very Substance; and is likewise strongly tied to the *Capsula Communis* there, where the *Vena Umbilicalis* is contiguous to it, and which makes the second Ligament; which tho' it be not always clos'd, yet after the Birth, has the use only of a Ligament, as before it had that of a Vein.

It

It has its Terminations, one at the Fissure of the Liver, as was before observ'd, and the other at the Navel : This keeps the Liver from pressing too much upon the Diaphragm.

The third Ligament ; which is describ'd by Authors to tie the Liver to the *Cartilago Ensiformis* ; and to be a strong, broad, thin Membrane hanging loose, and arising (according to *Spigelius*) from the Membrane that cloaths the Liver ; and according to *Glisson*, is a Duplication of it only, appears in truth to be nothing else but a Continuation of the *Peritonæum*, or at least to arise from the *Peritonæum*, as the *Mediastinum* does from the *Pleura* in the middle Cavity ; where from the *Cartilago Ensiformis* taking its Course to the Liver, it connects one to the other ; running far-

ther along to the Diaphragm, it joins likewise to the Liver, in its gibbous and upper part all along from the left Side to the right. This Connection that it has with these Parts by the Continuation of the *Peritonæum*, must needs keep the Liver from fluctuating towards the right or left Side, or backwards.

Besides these aforementioned Ligaments, the Situation of the Liver is preserv'd by several other Connections; which cannot properly have the Name of Ligaments; and under this Consideration comes the *Vena Cava*, as also the *Vena Porta*, by Means of which it may be said to be tied to the Mesentery, Intestines, Stomach, Omentum, Spleen, and Pancreas: The *Porus biliaris* likewise ties it to the *Duodenum*, and sometimes the *Jejunum*; the hepatick



patick Artery to the cœliack, and the Nerves belonging to it to the Intercostals.

These several Connections, as they most of them contribute to preserve the Liver in its proper Place ; so many of them shew the necessity there is that it should be so secur'd from the Danger which must ensue from its being displac'd.

But it is not so entirely fixt as always to keep in the same Posture ; for it is manifest it alters that oftentimes, as we do that of our Bodies ; which may be demonstrated by marking its Tumors with Ink ; for then, upon changing the Posture of the Body, the Tumor will leave the place so mark'd.

That this close Connection of the Liver with the Diaphragm, must oblige it to follow its Motion,

tion, is likewise a necessary Consequence. Thus in Inspiration, when the Diaphragm contracts itself in order to elevate the Thorax, it is with the Liver carry'd down farther into the Abdomen; as in Expiration, when the Diaphragm is relaxed in its turn, and is driven higher into the middle Cavity, the Liver goes along with it in the same Action.

This will be an Instruction to Physicians, who are to examine the State of the Liver, to let it be in the Act of Inspiration; for then the Liver being thrust down farther into the Abdomen, it is much easier to be come at, and more distinctly to be felt.

As in the natural State the Liver should always be subservient to the Motion of the Diaphragm; so in a preternatural one, it oftentimes mightily incommodes it,  
both

both by disorders of its own, and also by ill Offices done to it by the neighbouring Parts.

Thus the Liver being upon any Accident grown bigger, it induces a Difficulty of Breathing; a Symptom frequently observed in rickety Children, whose Livers are oftentimes larger than ordinary.

The Liver sometimes will grow to the short Ribs, which is the Distemper with us, I presume, call'd Liver-grown, and which of Necessity must be a very great hindrance to Respiration.

In Distensions of the Stomach likewise, by Meat, Drink, or Wind, the Liver is thrust upon the Diaphragm, and so checks its Motion. Distension of the Colon, the small Intestines, and in short of any part that lies upon the Liver, will crowd up the Diaphragm  
into



into the Thorax, and so rob it of that room it wants, to perform the Act of Respiration in, as it ought to do.

The Liver, as to its Bulk, is very different in different Bodies; in Fætus's it is much larger, than in adult Persons, in proportion to the rest of the Body. But as the learned *Glisson* observes, it is less in Eunuchs, than in Men not castrated; in Capons, than in Cocks; in Water Animals than in those that live upon the Land. But not being sufficiently convinc'd of these Matters of Fact, and that this great Author might be mistaken in his Observations; I shall respite the Consideration of them, and only in general take Notice, that a more sluggish than ordinary Circulation, even where there is no Indisposition of the circulating Fluids, will increase the

the Bulk of the part where it happens ; that is, if the circulating Humours are not carried away with that Velocity they are brought thither ; for then the Vessels will be distended ; and consequently this Bowel where the Vessels make-up so great a part of its Substance, will be so too, and it may be without much Injury to it ; as we see our Hands will swell with Cold : Which Instance so far agrees with us here, that the Circulation is retarded, and which occasions the Swelling without any great Inconvenience.

We are farther to consider, that this Bowel abounds very much with Blood ; for all the Blood that is sent to the Stomach, Intestines, Spleen, Pancreas and Mesentery by the great Artery ; namely, the cœliack, superior and inferior Mesenterick, in order to  
its

its return to the Heart, is taken up by the Roots of the *Porta*, to be transmitted thither ; and which therefore, upon the least Stop, will be apt to distend the Liver, as it passes thro' it, and be apt, as it were, to over-nourish it.

And under this Consideration, Tumors of all kinds will come ; such as any way indispose, and make the Liver incapable of performing the Office appointed it by Nature.

Thus the Liver is liable to Inflammations, which here are of the same Nature, and proceed from the same Causes, that Inflammations in all other parts of the Body do ; and may be defin'd an Effusion, or Extravasation of the Blood thro' the Substance of the Liver, which is caused either from the Thickness or Viscidity of the Blood, which makes it  
unca-



uncapable of circulating through the Capillaries of this Bowel ; or else from the Turgescence of the Blood in the Vessels, where by reason of its great Motion and Expansion, and Rarefaction it breaks thro' the Capillaries ; or else from Contusions by outward Violences. In all which Cases the Course of the Blood is check'd ; and the Blood not being able to be carried forwards, Distensions in the Parts that hold it must arise, and the Consequences may easily be apprehended, *viz.* by a weight and heaviness in the right Hypochondrium, and troublesome Pain, a Fever, with a difficulty of Breathing, which are the Symptoms of the Inflammation of the Liver.

This Pain is in a particular manner to be distinguish'd by the sick Person's turning himself from  
one

one side to the other ; which, as it is more in the Substance, or in the Membranes, is more or less acute. The Substance of the Liver, being much less sensible than the Membranes of it, suffers not so much under these Distensions.

In these Inflammations of its Membranes, the Pain will run all along the *Pleura*, which makes it somewhat difficult to distinguish it from the Pleurisy

Our Hints, in these Cases, we take either from the Pain, which is not altogether so violent here, *Cæteris Paribus*, as it is in the Pleurisy ; neither is the Pleurisy attended with that weight or swelling in the right Hypochondrium, which is the Seat of the Liver. Besides, the particular Complexion, or Colour of the Face, which for the most part in all Diseases of the Liver, is Icteric,  
 rical,

rical, shews the Disease, and from whence these Symptoms take their rise. It is a Disease of a very bad prognostick always, as may easily be imagin'd. But more so when it happens in the gibbous or convex part of the Liver, than in the concave, as is observ'd by Practitioners: And the Reason is plain, that it is so from the close Connection it has with the Diaphragm in its convex Superficies, whereby it readily communicates its inflammatory Disposition to each part; the Danger of which is plain from the use the Diaphragm has in Respiration.

Whenever these inflammatory Tumors happen, the safest way is to discuss them, if it be possible; but if that is not to be brought about, we are to promote



mote Suppuration by all the means we can. The Disease then takes another Denomination, and is call'd an Abscess; which is made by the Conversion of these extravasated circulating Humours into *Pus*.

As when this purulent Matter has by its Acrimony corroded, and made its way thro' the parts that contain'd it, it takes the Name of an Ulcer.

The Colour and Consistence of Matter discharg'd from it, gives us this Prognostick, that if it be white and well digested, there is Hopes of a Cure; but if it be red, fœculent, and fœtid, there is but little Expectation to be had from such a Case.

Having given an Account of the hot and inflammatory Tumors of the Liver, and the Consequences

sequences of them ; the cold ones will come next to our Consideration ; and they have their Seat either in the very Substance of the Liver, or in its Vessels or Membranes, or in two, or all these together.

Under the first Case falls the schirrhus Tumors of the Liver ; where its whole Parenchyma is turgid, with a serous watry Humour, which like a Sponge it seems to have suck'd up. The Vessels and Coats are relax'd in their Tone, and being fill'd and nourish'd with this depauperated Blood, want that Vigour they should have ; which when it so happens, they will in time be the Cause of a Dropsy : And this Distemper will have its first Seat here ; as oftentimes it is produc'd elsewhere, but afterwards

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by

by the Blood it communicates its Impressions to this Viscus.

The Ancients assigning to the Liver the Office of Sanguification, look'd upon it to be the chief Cause and Seat of the Dropsy. They were farther confirm'd in this Notion of theirs from the Observations they made, that all Diseases of the Liver, if let run to any height, terminated in the Dropsy; and which indeed shews that the Liver has oftentimes a great deal to do in this Distemper; yet not as a Bowel of Sanguification, but as a part through which a great Number of Blood-Vessels take their Course; and where the circulating Humours contained in them, may meet with Obstructions; which Humours being still more plentifully sent by the Heart, and the Liver not being able to carry them forwards,



wards, or at least with the same dispatch they are brought; either from its own Indisposition, or that of the Blood, the watry parts of the Blood in these Distensions and Weaknesses of the solid parts, transude thro' their Pores, which being just by them alter'd into a Body, constitute this Disease.

To make this the more intelligible, this following Experiment may serve, *viz.* by making a Ligature in the *Vena Cava*, between the Diaphragm and the Heart; for then the Blood which is sent from the Heart by the great Artery, not having a Passage to return to the Heart, the Veins will be distended, and the watry serous part of the Blood will make its way thro' the Vessels; and in an Hour or two's time, we shall see a great Plenty of extra-

vasated Serum in the Cavity of the Abdomen.

That Obstructions in the Liver, or any other part, may in process of Time, bring about what by a Ligature is effected in an Instant, is, I think, intelligible enough.

The Liver has likewise, as was before observ'd, its particular Tumors; that is, where their Causes do not equally diffuse themselves thro' the whole Substance of it. And they have likewise their Original from some Obstructions either in the Blood-Vessels, or the bilious Ducts, or from both.

We do not mean by Obstructions here, a total Stop of the Circulation of the Humours thro' the Liver; for so it would not be consistent with Life; but such a Disposition of these Humours, as to render them unfit, and indisposed

disposed for a free progressive and circular Motion ; whereby they move so slowly, that their Motion resembles a Stagnation. And here I take it to be in some Vessels especially, the rest being free enough to perform tolerably the Business of Circulation.

Stones, Ulcers, and schirrhous Tumours, as they proceed from these Indispositions of the Fluids, so they will aggravate the Cause of these Obstructions. But the most frequent Cause is the thick and viscid Constitution of the Blood, which being loaden with a too viscid Lymph, or saline coagulating Particles, loses that Acidity that it is necessary for it to have, to be able to run thro' the slender capillary Vessels of the Liver ; and so is the Author of Obstructions in the part where it stays.



The Bile likewise being after this manner thicker than ordinary in its Consistence, frequently produces Obstructions. For by this means it being incapable of being taken into the slender Capillaries of the biliary Ducts, it there stagnates; and being again received into the Blood either by the Roots of the *Vena Cava*, or the lymphatick Vessels, there follows the Distemper call'd the *Jaundies*.

Which, according to the Colour it tinges the Habit of the Body with, has the Denomination of the yellow and black *Jaundies*.

That the *porus biliaris*, or *Meatus Choledochus* may be obstructed by a glutinous and too viscid Bile, is not so conceivable; as by Tumors, Stones, &c. which do it by pressing upon them,

them, which has been discover'd by *Autopsy* to be a Truth.

But that the slender Capillaries of these bilious Vessels may be unable to transmit that Bile that is brought to them, gives no Difficulty to our Apprehensions. The Method we take to cure these Disorders, proves as much, which is effected by attenuating Medicines ; which as they open Obstructions, so they render the Fluid more liquid by their deobstruent Quality ; according to the Observation in Practice that those Medicines which facilitate the Secretions or Separations to be made in the Blood, do likewise dispose the Colatures to the better Performance of their Duty.

But many are of Opinion, that Obstructions alone are not sufficient to cause this Disease ; and also that it may happen without Ob-

Obstructions. To prove this first Assertion, they give us Instances of Persons labouring under Obstructions; as Chloretic and Hypochondriac Persons who have no Jaundies, and therefore that Obstructions alone are not sufficient. But here they should likewise have prov'd that the Liver was not obstructed in these their fancied Obstructions.

To prove the latter, *Sylvius* from *Autopsy*, brings Instances of Icteric Bodies that he had dissected, where there were no Obstructions to be met with: And to strengthen this Notion, the biting of Vipers, which are own'd by all Authors to give rise sometimes to the *Jaundies*, and which in so short a time can hardly be supposed to make such Obstructions, is a farther Argument.

This Effect may be imputed to  
a fer-



a fermentative dissolving Humour, which by the Biting, the Viper has communicated to the whole Mass of Blood; and which by its great Activity and Power it has of dissolving the Blood, renders it more bilious: The Bile and the red part of the Blood possibly differing in nothing else but in its greater or less Attenuation.

Passions will produce the same Effect. I have seen a Child's Skin, upon eating of Garden Nightshade-Berries, ting'd all over with yellow; which from the Cure it so readily received, cannot be thought to have proceeded from Obstructions.

These Instances given, encourage us to divide the *Jaundies* into a Disease that owes its Original to a hot as well as a cold Cause; to the great Attenuation  
and

and Fluidity of the Bile, as well as Viscidity, the Author of Obstructions.

This Distinction may be of Service to us in the Method of Cure of the *Jaundies*; which, as it proceeds from different Causes, the Method of Cure must likewise be diversified; for otherwise the Physicians treating all Icteric Persons alike, must oftentimes be disappointed of their Aim.

The Liver, as it is a glandulous Body, is a proper Seat for schirrhous Tumors; which here, as in other parts of the Body, are hard Tumors, resisting any Impression made upon them; and when exquisite, are without Pain, tho' at their beginning, before they are confirm'd, they will have Pain. These Tumors frequently arise from the Matter of them,  
being

being insensibly, and in process of Time, accumulated in the Liver ; tho' they are likewise the Consequences of Inflammations, where the thinner parts of the circulating Humours being evaporated, the remaining thicker Matter became the original Cause of a schirrhous Tumor ; and this, it may be, in the very Glands of the Liver ; a pretty plain Instance of which, I think, we have in *Glisson*, which he had from *Regemorter*, who, upon dissecting of the Body of one, who, in his Life-time, was for several Years troubled with strumous Swellings in his Neck, he found his Liver to be all over stuff'd with Glands of the bigness, some of a Pea, others of Beans, which being cut, contained nothing liquid in them : But, as in Figure, so in Substance, they exactly resembled



sembled Glands, compounded, as he describes them, of a Clay-coloured pituitous Substance.

These Glands had so encreased the Bulk and Weight of the Liver, that it was twice or thrice as big as naturally it should have been.

The Lymph being sometimes extravasated, will make a peculiar Coat of its own, and be contain'd as it were in a *Cystis*; and which, according to the Consistence of the Matter of the Tumors, bears several Denominations.

Thus, if the Matter be pretty much of the Consistence of Honey, they are called *Melicerides*: If it be still coagulated into a harder Substance, they are called *Atheromata*: And if it be yet harder, and have a Consistence

sistence as firm as that of Suet, they are called *Steatomata*.

Instances of these kinds of Tumors are to be met, tho' rare : And one I shall relate to you from the abovenam'd Author, Dr. *Glisson*, in his elaborate Treatise of the Liver, which is remarkable enough ; and that is of the *Atheromatous* kind, which was found in the convex and gibbous part of the Liver backwards, near to the Diaphragm, in the place where it is perforated by the *Vena Cava*. The Figure of it was round, and near as big as one's Fist ; and being freed from the Liver, it weigh'd five Ounces, six Drachms, and thirteen Grains. Its Coat or *Cystis* was almost as thick as the *Cutis*, and contain'd in it Matter or Substances of two sorts ; both of which were very thick in Consistence, and not at all

all Fluid : One was transparent like to Jelly, the other look'd like a thick Cream. In this Body the Liver was larger than usual ; as also were the Veins of the Mesentery, Intestines, Stomach, and particularly the Spleen. Which could only happen from the pressure of this Tumor upon the capillary Blood-Vessels in the Liver ; whereby they became so streightened, as not to be in a Condition to give that free Conveyance of the Blood they do in its Circulation ; and which therefore not only influenced all the Vessels of the *Porta* within the Liver, but also all those that fed the *Porta*, which by this Stop given to the Circulation, distended them by this over-load of Blood ; and which, as was before observ'd, will be the Consequence in any part, where the

†

Blood



Blood is brought with too great Impetuosity, or in such Quantities as it cannot be carry'd as readily away.

The Liver is likewise incident to watry Tumors, call'd *Hydatides* ; which are pellucid Bladders distended with *Serum* : And they appear to be the very Membrane of the Liver, raised from its Substance by this serous Humour. These, according to the Liquor they contain, are sometimes as large as one's Fist, and oftentimes less ; sometimes fewer, and sometimes more in Number, and that both in Men as well as other Animals. If these by any Accident are at any time broken, the Water contained in them falls into the Abdomen ; from which a Dropsy must certainly ensue.

In Sheep that die of the Rot, as it is generally phras'd, we oftentimes meet with Tumors al-

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most

most peculiar to them in the Body of the Liver ; in the middle of which there is a Cavity full of Water, and which likewise contains Worms in it.

The Liver is single, and but one ; and in Men but one continuous Body ; tho' in Quadrupeds and several Birds, it is divided into Lobes. The convex Superficies of it is very smooth, but its concave is more uneven ; and besides that great Fissure where the *Vena Umbilicalis* enters it : And which has created, in my Opinion, that needless Dispute about the Division of an human Liver into Lobes. \*

It has three *Sinus's*, as they are call'd by some, or Impressions made, as I conceive, by the parts it lies upon ; the largest of which is in the left Side, where the Liver lies upon the right Side of

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\* Vid. Dr. Drake's Anatomy, p. 100, &c. Edit. ult.

the Stomach, the *Pylorus*, and a part of the *Intestinum Duodenum*. The second is in the right Side near the lower part, and contains almost wholly the Gall-bladder. The third is in its upper part, where the *Vena Cava* goes out of the Liver. These are the most remarkable Cavities; and though there are several other Impressions made upon it by the adjacent parts, yet they are of that small Consideration, as not to deserve our farther Notice.

I think it may with Safety be affirm'd, that all Animals have always a Liver, and but one, notwithstanding these following strange Histories, which I am going to relate to you, whose Veracities are not much to be rely'd on.

The first is from *Zacutus Lusitanus*, in his Book *de Prax. Medica Admiranda*, in the 38<sup>th</sup> Secti-



on, which communicates the Observation of a Woman, who, upon Obstruction of her *Menses*, had fallen into a Tympany, of which she dy'd ; in whose Body, upon Examination, there was no Liver to be met with, he says, but in its stead a great Mass of Flesh, or a filthy Substance of great Bulk, extended from the Region of the Liver, down to the Navel, which being taken out and weigh'd, the Weight of it amounted to six and thirty Pounds.

The second is from *Skeuckius*, in his third Book of Observations, and the second Section ; and that is of an *Antwerp* Merchant, in whose Body, upon Dissection, there were neither Liver nor Spleen to be seen. But the Intestines were in Substance altogether carnous, and much more solid than the muscular Flesh generally

nerally is. It was almost as firm, he informs us, as that of the Heart. The *Vena Cava* had its rise from the Intestines, after the same manner the *Vena Porta* uses to have in other Bodies. This Man, in his Life-time, was very liable to Inflammations, and Abscesses in his Intestines, and for some time before he dy'd, had labour'd under a Dropsy.

The third, *Skeuckius* barely relates from *Gemma*: And that is of one who had two Livers. But there being no mention made of this Subject's having two Gall-bladders, two excretory Ducts, two *Vena Cava*'s, and two *Vena Porta*'s, we may favourably conclude, this Author might, without any Pleasure he had of telling a strange Story, mistake a Liver unusually divided, and as there are Accidents and Lusus's in Nature,

for two Livers. Nor might the Mistake of the former Anatomists be less, who from the odd and unusual Situation and Configuration of the Liver, fancy'd it not to be at all.

However, it must be confess'd, that these are very extraordinary Instances ; tho' not concluding that any Persons can live without a Liver, or some such Organ for the Separation of Bile.

This red Colour that it shews it self here to us with, is not its proper Colour, but is wholly owing to the Blood it has within it, which we may, by Injections of Water, so clear it from, that it will become white.

It is cloathed with a thin Membrane, whose Origin some will have to be from the *Peritonæum*. But, in my Opinion, the *Peritonæum* may be said as well to be from



from this Membrane ; they being form'd in the Fœtus at the same time. And farther, when Chops or Fissures happen at any time to the Liver, and that this Membrane is broken, Nature effects the Cure by bringing a new Skin on the Lips of the Wounds on both Sides ; the Matter of which is brought by Vessels of its own, and none belonging to the *Peritonæum*.

It may be separated from the Substance of the Liver, but hardly without taking some of its Substance along with it.

The Use of this Coat is to protect the Liver against any Injuries that might be offer'd to it by the neighbouring Parts ; and to keep it whole, and together ; which is of it self a Substance very friable and brittle. And that such a Cure was necessary, must

be concluded, as well from the safe Passage its Substance is to give to all the Blood, which is brought to it by the *Vena Porta*, from the Spleen, Pancreas, Omentum, Mesentery, Intestines, and Stomach, as also because by it are to be made the Separations of the Bile. So that, whenever there is a Solution of this Continuity, *viz.* a Breach made by any Accident; in this part the Bile can be no longer separated from the Blood, but mix'd together, must stagnate.

The Causes of these Solutions are either Wounds, Contusions, or Corrosions by sharp Humours; Obstructions, of which before, and Inflammations, are taken Notice of by some Practitioners. And sometimes in Wounds and Concussions of the Brain, there has been found an Imposthume of the  
Liver;

Liver ; which is mention'd by *Job à Mekreen*, in his *Observat. Medic. Chirurgic. Observat. 1.*

They proceed (according to them) from thick Flatus's, which are kept in by this outward Coat, and swell and inflate the Liver ; and by distending the Membrane, create that Pain complained of in this Case.

The *Dignosticks*, to know this Disease by, they tell us, are from a Swelling in the right Hypochondrium, accompany'd with very great Pain, which yet is not continual, but is sometimes greater, as at other times less ; and carries not that Heaviness or Weight along with it, that other Tumors of the Liver do, and which, if press'd upon with one's Hand, do readily give way without any Noise or Appearance of Fluctuation, to give any Umbrage for suspecting an Abscess there.

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I confess, it is not impossible, but Wind may be gather'd here, so as to divide and separate this Membrane from the Substance of the Liver, as well as serous Humours, which is oftentimes known; yet probably, they are oftner Distensions of the neighbouring membranous Parts, which might, from their nearness of Situation, be mistaken for those of the Liver. For I don't recollect any one Instance, where, upon Dissection, the Liver was ever found so inflated. And it is farther own'd, that in these Cases, the Colour and Complexion of the Face and Skin is not so alter'd, as it usually is in other Disorders of this Bowel.

The Danger that must ensue from the Wounds of the Liver, its Contusions and Corrosions, may easily be apprehended; as  
that

that when they happen in the Vessels, they are still worse than when in the Substance ; tho' for the most part they are both together affected. Yet there are Instances to be met with, even where Wounds have been cur'd; though possibly, not one in a thousand can escape. And to this Purpose *Hildanus* mentions one who recover'd, after a part of his Liver had been cut out from the Wound he had receiv'd, and where the Patient suffer'd very severe Symptoms. I could furnish you with more Instances, but this may be sufficient to shew, that the Wounds of the Liver are not always Mortal, as have been pronounc'd.

The Figure of the Liver is contriv'd the most agreeably that can be, for the Performance of the Actions, and the Uses design'd it by Nature ; as also the most accom-

accommodated to the neighbouring circumambient Parts; otherwise, where the Parts contained are not fitted to the Parts containing, they must of necessity incommode one another in their Actions; and that this is the Contrivance of Nature, to avoid this Inconvenience, may be argu'd from the Diversification of the Liver in several Animals, which it suits to the Cavity that contains it, and best disposes it to receive the change it is to make, upon the change of Posture in the Animals, in their several Actions and Motions.

The Substance of the Liver is soft and brittle, excepting the Vessels and Membranes, and may be pretty easily wash'd away, scrap'd or brush'd from the Vessels that are interwoven with it. \*

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\* The manner of doing of which, may be seen in Cowper's Anatomy of Human Bodies.



The Ancients judg'd it to be nothing else but concreted Blood ; but Time and Industry have taught us better, and plainly discover'd to us, that its Parenchyma are Glands fix'd to the capillary Extremities of the Vessels, or into which the importing Vessels empty themselves, and the Exporters have their Origination there, to receive the several Pieces, which by the Similitude of their Pores they are best able to do. It has Vessels of all Sorts, and in great Plenty ; as Veins, Arteries, Nerves, lymphatick Vessels\*, and proper excretory Ducts ; to which some add the Gall-bladder, and consider it only as an Expansion of the *Meatus Cysticus*.

It has Veins of two Sorts, and which bear two different Offices ;

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\* Vid. *Nuch's Adenographica Curiosa*, and Dr. *Drake's Anatomy of the Liver*.

for the *Vena Porta* is an importing Vessel, and what is peculiar to this Bowel, brings Blood to it: And in this Particular, answers the End and Use of an Artery. As it enters into the Liver, it is strengthened with another Coat, which by some is call'd *Vagina Porta*, others, *Capsula Communis*; and because the *Porus Biliaris* is involv'd in it as well as the *Porta*, it is dense and car-nous, and goes along with it in all its Ramifications; and in this respect likewise it makes the Figure of an Artery. About half an Inch after its Entrance into the Liver, it forms, as it were, a *Sinus*, and there it divides it self into five large Branches, which disperse themselves over the whole Liver.

Thus this Vessel, in both its Extremities, spreads it self into  
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an infinite Number of Branches. The Superior, as is here describ'd, run thro' the Liver; the Inferior are like Roots distributed thro' almost all the Parts contain'd in the Abdomen, *viz.* Spleen, Stomach, Guts and Mesentery, where they take up the Blood, and convey it to this Trunk; where it is farther to be transmitted by these superior Ramifications to the *Vena Cava*, which likewise has its capillary Roots dispers'd all over the Liver, and are corresponding here to the Capillaries of the *Porta*, as Veins are to Arteries other parts of the Body.

These several Ramifications make three, or sometimes more remarkable Trunks, which likewise before they leave the Liver, run into one common Trunk, which presently after its Exit, takes its Course through the Diaphragm,



phragm, and has the Name of the ascending Trunk of the *Vena Cava*.

The Ramifications of the *Vena Porta* running from the concave Side of the Liver upwards, and towards the Sides, as those of the *Cava* taking their Course obliquely downwards, do frequently cross each other: But intermix'd as they are, if you separate the Membrane that invests the Liver from it, and scrape away the Substance or Parenchyma of it, so as to come to the Sight of their larger Branches, you may easily distinguish them from one another, by blowing into the great Trunk of either of them; for then you shall perceive the Wind to distend the Branches belonging to that Trunk you have blown into, without touching the other. But their several Branchings

ings may be yet plainer shewn, by injecting Wax into their great Trunks, and which ting'd with different Colours, gives you a plain View of them. A Figure of which may be seen in Mr. *Cowper's* Anatomy of Human Bodies.

And here we are to take Notice of a Passage, which the Liver in Foetus's has, more than in the adult, and it is call'd *Canalis Venusus*, which arising from the *Sinus* of the *Porta*, carries a great part of the Blood brought by the umbilical Vein, directly in full Stream into the *Vena Cava* above the Liver, and which after the Birth for the most part is clos'd.

These Ramifications shoot themselves into Capillaries so extremely slender, that they are by no means to be discover'd by the Eye, or by any other help, that has been yet thought of,

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which has occasion'd great Difficulties about the manner of the Blood's circulating through this Bowel.

Some maintain these Vessels to be united by an *Anastomosis*, and that the *Vena Cava*, viz. the Branches of this Vein are continuous to those of the *Porta*; this Structure, they think, is as reasonably to be suppos'd here, as it is to be demonstrated by *Autopsy*, by the help of Microscopes in several parts of Animals; and that Objection, that if these Blood-Vessels are thus united, there can be no Separation made of the Bile, I think, may be easily satisfy'd, by conceiving that the Roots of the biliary Ducts have their Origination all along the Sides of the capillary Vessels of those Veins.

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Thus



Thus the Liver then being suppos'd to be wholly vascular, its Glands are to be consider'd as so many innumerable little Grape-like Circumvolutions of Vessels, which like so many small ty'd Bottoms of Thread wound up carefully and conveniently together, have all along in their Passages and Channels, an infinite Number of biliary Vessels opening with their little Mouths into them, there to imbibe the Bile in the Circulation of the Blood, which by a Similitude of Parts, and Configuration of Pores, they are enabled by Nature to do ; after the same manner as the *Chyle* is taken into the Lacteals from the Intestines.

But supposing these Convolution of Vessels to be the only Glands, and the very Texture of the Liver: And that in this long

Tract of Vessels, there is sufficient Opportunity given for the biliary Vessels, which are all along affix'd to their Sides, to take in the Bile from the Blood; there will still remain this Difficulty to account for, *viz.* the Taste the Liver has. For cleanse it as free as you can from all the circulating Humours it contains, it will still be of a different Taste from that of any other Gland, or glandulous part of the Body; which seems to argue it to me, to be of a different Substance; and so, that different Glands have different Substances: For if Glands consisted of Vessels only, *viz.* Veins, Arteries, and Nerves, with their excretory Ducts; these Vessels being all alike of the same Taste, in all Parts of the Body; the Glands being freed from their Juices, must needs be so too, the  
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contrary whereof is manifest ; and so we must conclude them to be constituted of peculiar Substances different from the Vessels, which offer themselves with their particular Tastes.

Therefore, I am prevail'd upon to think, that these Glands that make up this peculiar Substance of the Liver, are affix'd to the Extremities of the Ramification of the *Vena Porta*, as was before allowed, &c. These Glands (according to the elaborate *Malpighius*) have six Superficies like a Die ; and which he says are much more conspicuous in Fish, and the more imperfect Animals, than in Men.

These Glands hanging like Grapes upon a Bunch to the Vessels, make as it were so many little Lobes, which are all cloath'd with their proper Membranes.



These I take to be the Medium between the importing and exporting Vessels; and that by the Interposition of these, the Importers transfuse their Liquor into the Exporters. How this Separation is made, shall be the Consideration of another Place.

Notwithstanding the *Vena Porta* does the Office of an Artery, in bringing Blood to the Liver, it has an Artery of its own, which arises from the Cœliack, and is call'd the hepatick Artery.

In Men it is very considerable, and bears Proportion to the Diameter of the *Porus biliaris*; but in Quadrupeds it is not so large: And the reason of it may be, that the *Vena Cava* being plac'd more horizontally in their Liver, it does not so much require the Assistance of the arterial Impulse, directly to carry the Blood  
for-

forward in its Circulation ; whereas in Man, the ascending Trunk of the *Vena Cava*, in his upright Posture, being perpendicular, must of Consequence stand in need of a greater Impetus to do it.\*

It has Nerves from that superior Plexus of the Abdomen, which *Willis* calls the Hepatick, and arises from small Twigs of the intercostal Trunk of the right Side. From this Plexus a great Bundle of Fibres which take their Course towards the Liver, and enfolds the Artery like a Net, on purpose, as is thought by some, to give a check to the Motion of the Blood, if it should chance at any time to be too impetuous.

These Nerves supply the Liver with animal Spirits, which if they do not promote by their Mixture, the Separation that is to be made

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\* Vid. Dr. *Drake's* Anatomy.

there, they at least give the necessary Life and Vigour to the Membranes and Vessels of it, which being thus preserv'd in their Tone, are capable of performing their Parts, without which they could not do it; no, nor so much as receive any Nourishment.

The Liver abounds with a great Plenty of Lymphæ-Ducts, which are discernible enough in most Bodies that come under our Inspection: But in some they are much more so, than in others.

*Malpighius*, desirous to make the Liver a conglomerate Gland, and which then he thought should have but one excretory Duct, could not think them to take their Original from the Substance of the Liver it self, but from those conspicuous conglobate Glands only, which discover them-



themselves in the hollow of the Liver, under the *Capsula*, in the place where the *Porta* and *Porus biliaris* enter it ; from whence taking their Course directly along the Mesentery, they open themselves into the *Receptaculum Chyli*.

But the contrary, I think, may be readily made appear ; and that these Lymphæ-Ducts have their Original from the Substance of the Liver all over it: No Part which receives Nourishment, can be without them ; which, I presume, will not be deny'd of the Liver.

To make this more plain, let us consider the Method Nature follows in the Distribution of the Nourishment of our Bodies ; for which great End the Circulation of the Blood seems principally to have been instituted ; for by this Means the nutritious Parts,  
together

together with the rest of the circulating Mass, are carry'd to all the parts of our Body.

The serous Part of these circulating Humours, is the greatest part of them ; and in respect to the nutritious Parts of the Blood is their Vehicle, and keeps them sufficiently diluted for their Conveyance to the respective Parts ; which when it has there first for their Nourishment, it returns again to the Blood by the Lymphaticks.

Thus the lymph or serous Part of the Blood, to digress a little, is of great Consideration ; and obtains various Uses, according to the variety of the Glands in the Body, where it is separated.

That Separation made of it by the Glands of the Mouth, Stomach, Intestines, and Pancreas, serve to macerate, digest, and dissolve

dissolve our Food, and to extract as it were the nutritious, gelatinous parts of the Aliments, with which by their Vehicle, they are taken into the Laeteals by that way to be convey'd to the Blood, and so to all parts of the Body, and consequently to the Liver ; which when they are dispos'd by the Lymph for its Nourishment, being thus depauperated, return again to the Blood, and is received in all parts of the Body by proper Vessels, call'd *Lymphatick*, there to receive new Impressions.

This being granted, we may safely conclude, that no parts of the Body that receive Nourishment, can be without them ; and consequently the Liver throughout its Substance must have them. But to suppose this Separation is to be made by conglobate Glands alone, is not so necessary, as the  
late



late worthy Author seems to hint. For these Lymphaticks that return their Lymph to the Blood from the Limbs, do not discover to have their Origin from any near the Glands; and I think it not difficult to conceive, how the thinner Parts of this Fluid may drain away from those thicker nutritious Parts, which it has left fix'd in the Pores of the Parts for their Nourishment, and be taken in at the Roots of these Lymphæ-Ducts, which afterwards running into larger Branches, and make those Trunks which are conspicuous on the Surface of the Liver.

I must confess, the extreme Capillaries of these Vessels, are not to be prov'd by *Autopsy*, no more than those of the Veins and Arteries are: But if we compare these conspicuous lymphatic Vessels, with Blood-Vessels of the same

same size, and consider the Number of Capillaries that must meet together, before they constitute Trunks of that bigness; we may be easily led into a Notion, that the Capillaries of these Lymphatics likewise are sufficient in Number to have overspread the whole Substance of the Liver, or rather from their Number that they must have done so, to be able to have constituted Vessels of that size.

The Gall-bladder is a membranous Vessel or a Cavity of the shape of a Pear, and is situated in the hollow Side of the Liver, on the right Side, and under the thickest part of it; where it forms it self a Cavity to lodge in. That Part which hangs without the Liver, rests upon the right Side of the Stomach, and Colon, which it often dyes of a yellow Colour.

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It is divided into its Fundus or Bottom, and Cervix or Neck. The Neck is much the narrower part, and is wrinkled in its inside to hinder the too hasty descent of the Bile.

The Bottom is larger and wider, and is that part which contains the Bile, and which it generally tinctures with its Colour.

As to its Bulk, it is very seldom the same in different Subjects. Its Bottom, extended with Bile in Figure and Bulk, pretty much resembles a small Hen's Egg, which contracting it self into a narrow Neck, is continu'd to the *Meatus Cysticus*. But neither is the Figure the same in all Bodies; for in some it is longer and narrower, and in others shorter and broader.

It is fix'd to the Liver both by Vessels and Membranes, viz. by  
the



the common Membrane, and by a Process of the *Capsula* that involves the *Porus biliaris*, and *Porta*.

Besides these Membranes, some Anatomists will have the Gall-bladder to consist of three proper Coats.

The first and outmost which they call the vascular one; the second is muscular, which they describe to consist of two Orders of Fibres: The third, which is the inmost, they look upon to be nervous, after the Texture of the Stomach. But whatever might lead these Inquirers into this Mistake, I presume it may be made appear, that its Texture is not according to their Description, by ocular Demonstration; for upon Examination of it by a Microscope, we find it to be compos'd of two Membranes only; with

with a spongy vesicular Substance between them. These Membranes, like two Walls, protect this middle Substance contain'd within them, and which consists of an infinite Number of Ramifications of Vessels, running along the length of the Gall-bladder, and as it were between Membranes lamellated, as I had an Opportunity of discovering with a Microscope, in a piece of the Gall-bladder dry'd, which before had been blown up with Wind.

These Vessels, without Dispute, terminate into those Glands that serve for the Separation of the mucous into that Viscus which is to defend the inward Membrane against the Acrimony of the Bile.

This then being the Structure of the Gall-bladder, it is plain, that it is passive in its Evacuati-  
 ons, and that they principally de-  
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pend upon the Pressure of the neighbouring Parts.

The Gall-bladder has belonging to it, Veins, Arteries, Nerves, and Lymphæ-Ducts, and Gall-Ducts. The Veins empty themselves into the *Porta*. There are two of them, and are therefore call'd *Cysticæ Gemellæ*. The Arteries and Nerves it has from the hepatick Vessels.

As the Veins make their Exit, the Arteries and Nerves enter into the Bladder about its Neck, which from thence running along towards the bottom, become more and more divided, sending plentifully every where Branches all along the Circumference of the Bladder.

The Lymphæ-Ducts run along from the bottom of the Bladder to the Neck, where they join into one Trunk.



The Gall-Vessels belonging to it, are of two Sorts, *viz.* such as bring the Bile to it, and such as carry it away.

The Vessels of the first kind have their Original from the Liver; some of which probably come directly to the Bladder from the respective Glands, whilst others, as may be prov'd, open into the Hepatick-Duct.

*Glisson* has long ago taken Notice of a very remarkable Gall-Duct, which enters into the *Vesicula Fellea* at its Neck, by that part where it abounds with Wrinkles. This Trunk, says he, tho' it be small, and scarce by a hundredth part so big as the *Porus biliaris*; yet it distributes its Branches and capillary Roots, thro' the Parenchyma of the Liver, and seems to have a Branch of the *Porta* accompanying it,

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as

as well as the *Porus biliaris* has; which it is hard to distinguish it from, any otherwise than that it takes its Course towards the Gall-bladder.

He farther adds, that it is difficult to find its Insertion here, as is that of the *Ureters* into the urinary Bladder; but may be suppos'd to be of that spongy Protuberance, which is to be discover'd near the *Meatus Cysticus*; and which he thinks does the Office of a Valve, and hinders the return of the Bile.

This worthy Author farther owns, that he has discover'd two of them sometimes; but this he thinks to be only *Lusus Naturæ*.

In this *Viscus* are several Ducts that open themselves both into the *Vesicula Fellea* near its Neck, and also into the *Meatus Cysticus*.

This I have plainly seen in an Ox's Gall-bladder, by tying the *Meatus Cysticus* near to that part, where it unites it self to the *Porus biliaris*, so close, that no Wind can pass that way ; for then by blowing into the Hepatick-Duct, you shall presently see the Bladder inflated. And farther, if you lay open, with your Incision-Knife, the Bladder, together with the *Meatus Cysticus*, to the Ligature, you shall find upon blowing, the Wind to vent it self by several Mouths, both into the *Vesicula Fellis*, and the *Meatus Cysticus* ; and which plainly proves, as was before taken Notice of, a Communication between the *Ductus Hepaticus*, and those of the *Vesicula Fellis*.

These Ducts are so very slender, that I have not been able my self, or ever heard any that  
were



were to inject them with Wax, or any other thing that would more plainly discover them to us; but I think, from the foregoing Experiment, their Existence is clearly evinc'd; and which then may be suppos'd to receive Bile by their capillary Roots, as those of the *Porus biliaris* do, in order to convey them to the *Vesicula Fellis*, there to be repositied for the Purposes of the Animal OEconomy, according to the Institution of Nature.

From their Office, there has been the Denomination of Hepatick-cystick-Ducts given them. The Ducts that carry away the Bile both from the Gall-bladder and Liver, shall be given there, and are call'd the Hepatick-Duct, and the *Meatus Cysticus*, and the *Ductus Communis Choledochus*.

The Hepatick-Duct arises from the Liver in several Branches or Roots, where taking its Course without the Liver, it meets with another Duct, which is that now mention'd, and is call'd the *Meatus Cysticus*, which coming from the Gall-bladder, about two Inches (the same distance that the Hepatick-Duct is from the Liver) it is join'd to it ; where from the Office it bears, both in respect to the Liver and Gall-bladder, it takes another Name, and is call'd the *Ductus Communis Choleodochus*, or common Duct ; which is the third Duct mention'd, and is farther carry'd to the *Duodenum*, or *Jejunum*, where it is inserted obliquely into one of these Intestines about four or five Fingers breadth from the *Pylorus* at the same place, where the Pancreatick-Duct opens it self into the Intestines oftentimes.

times. By this oblique Infertion, and by the spongy Protuberance of its Mouth, which seems to have the use of a Sphincter-Muscle, the Regurgitation of the Bile to the Liver is prevented.

The Hepatick-Duct, and the *Vena Porta* run along together thro' the whole Liver, and being invested with one common Coat, the larger Branches of it with the larger of the *Porta*, as the smaller with those of the smaller, they seem as if they were but one Vessel; yet upon Examination, they are easily distinguishable: For the biliary Ducts are, all along in their Ramifications, much less than those of the *Porta*, and are likewise ting'd with Yellow from the Bile which they carry; and are to be seen by blowing into the *Porus biliaris*, and still plainer, without



any Dispute, to be shewn, by injecting Wax into them, as is here to be seen.

We meet with Stones frequently in the Bladder, which are much lighter, and more spongy than those of the urinary Bladder, and will swim above Water; which sometimes lying in the Neck of the Gall-bladder, obstruct the Hepatick Ducts opening into it, and by that means prevent the import of Bile into it, and causes an incurable *Jaundice*. In which Cases it has been observ'd, that the Bladder has been full of a Liquor, that has not had the least Taste of Bile, and which we may reasonably think to have been the Matter separated by the Glands of the *Vesicula* before spoken of.

Having describ'd the Liver at large, with the Vessels belonging to it. The next thing that  
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offers it self to our Consideration, is its Office and Function, which is evidently the Separation of the Bile from the Blood. But how this Bile is separated, is a Difficulty worth our inquiring into. \* To solve this, some have imagin'd it to be done by the help of Fermentation; whilst others think it may be brought to pass Mechanically, without the Assistance of any Ferment, purely by the impelling, progressive, and intestine Motion of the Blood; where the Glands of the Liver, with their importing and exporting Vessels opening into them, like Sieves or Filters, give Passage only to its bilious Parts, according to the Configuration of their Pores, and the Conformity of the *Moleculas* of the Bile that is to pass thro' them.

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They that cannot look upon these Glands to be merely Passive, but that they contain something of a fermentative Nature in them, by which the circulating Humours, as they run thro' them, are so alter'd, as to become better dispos'd for quitting its bilious Parts ; are mov'd to it from a Consideration of the close Union by which those bilious Parts adhere to those of the Blood in the *Porta* ; which is not by simple Contact only, and so easily separable, as Bodies slightly mix'd are.

This they think to be apparent from the Taste of the Blood in the *Porta*, which has not the least of that of Bile in it ; and which after Separation, will, if remix'd to that or a greater Quantity, tho' but a few Drops, sensibly communicate its Taste to it. This, as it argues a superficial  
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Mixture only here, so it proves a close Union of it with the rest of the circulating Humours in the *Porta*, where by it is as it were lost.

This they enforce, by urging, that the Blood has longer time to make its Circulation in, thro' the Liver, than in other Parts ; it being not so much accelerated by the direct rapid Motion of the arterial Blood in its full Force, as it is in the Kidneys, and other Organs of Separation, and consequently more subject to Obstructions, from whence proceeds most commonly a *Jauudice* ; for the Arteries are few, in respect to the importing Veins. This Circulation they look upon to be a great Contrivance in Nature, to give sufficient Time and Opportunity for the Ferment to operate in, and destroy this close Connection.

But however plausible this Opinion may seem, and that Fermentations

mentations are able to bring these and greater Changes in the Blood; and that the slender Capillaries of the Vessels and Glands are suitable and proper Places for this Ferment to perform its Operation in, as the slower Progress of the Blood in them gives Time: Yet it will still remain as difficult to account for, how the Liver came by this Ferment. And either it must make it it self, or be serv'd with it elsewhere. This last, way I know not, that it is offer'd at by any, there being not the least Discovery made of any such importing Vessels as might convey it thither.

That the Liver serves it self with this Ferment, is not more probable. For besides, that the Difficulty would be no less to shew how even that was made here; it is plain, that there is no such peculiar

peculiar Juice to be met with ; no Organs for the Separation of any such Liquor (the Bile excepted, which is the Matter in Question how it is separated) are to be seen. And farther, the Taste of the glandulous Substance of the Liver, which is not at all disagreeable, if cleans'd from the Liquor in the excretory Ducts, *viz.* the Bile it self, shews there is nothing of that kind contain'd in them.

On the other side, they that endeavour to explain this Separation mechanically, and who suppose the Assistance of a Ferment not necessary, seem not to labour under such a Necessity of supposing Improbabilities. Nay, the Mechanism of this Bowel, seems extremely to encourage us to this Explication. Here is the *Vena Porta* branching it self into very slender Capillaries ; a paren-



renchymatous Substance, or Fibre-like Texture of the Liver. Here are Mouths of exporting Ducts opening into them, of different Pores, to receive their Liquors proportion'd to them. And here is the circular and intestine Motion of the Blood, with a farther *Vis Motiva* of that of the Compression of the Abdomen in Inspiration, before taken Notice of, to drive these different Juices into their proper Pores. And hence it is that Emeticks are so serviceable in a *Jaundice*.

To prepare you with our Notion of it, it may not be amiss to take here into our Consideration, the Fluidity of Liquors, which seem to consist in the actual Division of the Parts of the Fluid; which taken by themselves, are no more, than small, hard, and figur'd *Moleculas*; and which being join'd in a Body,  
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are only contiguous to one another ; but being of suitable Surfaces, are so free and fit for Motion, that they are perpetually changing Places, as we see from the ready Mixture of many Things put to them.

The different Consistence, Structure, Configuration, and Motion of these *Moleculas* that compound the particular Fluid, constitute their different Natures and Properties. Thus the *Moleculas* that make up the Body of Matter, are Homogeneous, and like to themselves, yet very different from those of Oil.

Now, if at any time two Fluids of a different Nature are mix'd together ; and their Parts are so accommodated, as but barely to touch one another, the Mixture which arises from them, may very well be compar'd to that of solid Bodies

dies being jumbled and mix'd together ; and which because we see may be easily separated again by sifting, so may mix'd Liquors by Filtration ; which may reasonably be thought to be brought to pass much after the same way, viz. by the Structure of the Fibres, as the Separation of the hard Bodies were by that of the Sieve ; whereby the Figures of the *Molecules* of the Fluid are so adapted to the Figure of the Pores, thro' which they are to pass, that they can receive such alone ; and all others, as not able to enter, must be excluded.

This Mechanism may be easily conceiv'd to dispose of the Parts of Fluids, so loosely join'd, after that manner : But when the *Molecules* constituting a Fluid are heterogeneous, yet consist of Parts so closely united, that, in  
respect



respect of their Superficies, they are homogeneous, there seems to be something forcible and violent ; such as some Ferment or other to break this close Texture. This then lies upon us to shew, that the Liver, by its Structure, is able to effect this Change in the united heterogeneous Parts in the Blood, without any Fermentation.

To make this the more obvious, we are to consider the mechanical Progress that Ferments make in dissolving the Bodies they are mix'd with. And they are, I think, acknowledg'd on all Hands to effect it, by insinuating themselves into the Pores of the Parts of the mix'd Body ; where they, like Wedges, being farther driven by some impelling Causes, do cleave and tear to pieces the Parts they have insinuated them-

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selves into ; and after that manner, intirely destroy their Union. But a larger Time and Space is always thought necessary for Ferments to act their Parts in ; than the Time of the Circulation of the Blood thro' the Liver, and the very slender Capillaries of the Blood-Vessels will allow of, as was before observ'd. On the other Side, if the Blood, with the Bile, tho' in strict Union, without any such additional Ferment, be driven with sufficient Force into the Substance of these Sieve-like Glands ; where the Mouths of the exporting Vessels likewise have their Originations ; and which, in a sound State, are easily suppos'd not to give way, or alter in the Configuration of their Pores, its Texture may be broken into, for the Mouths of the different Ex-  
 † porters

porters to receive the Parts suitable to them. Nay, farther, can it not be apprehended, that this impulsive Force, by which the Blood is driven thro' the Liver, is sufficient to force the proper Parts into the Mouths of the several Exporters, and where in a manner like melted Metals, they are oblig'd to take the Form of the Mould they are cast in ; so that as Ferments, by their Wedge-like Action insinuating themselves into the Pores of the *Moleculas*, and heterogeneous Parts of a mix'd Body do destroy their Union ; so here, these *Moleculas* being driven thro' the strait Pores of the Part, are broken to pieces, and forc'd into the Shape suitable to the Parts they are to pass thro'.

To encourage us in this Hypothesis, Nature seems very sol-



licitous in proportioning the Motion of the Blood thro' the Liver, to the Task it is to perform there. And for this Purpose there seem to be in several Subjects several Contrivances. In Man, who walks upright, Nature has supply'd him with an Hepatick-Artery much larger than in Animals, whose Position is more horizontal; as in Horses, tho' their Liver be much larger; as if the exact proportioning of this Motion was a Matter of the greatest Consequence; for if it be carry'd too forcibly or rapidly thro' the Liver, there might not be allow'd sufficient Time for the Action, or it might offer Violence to the Parts thro' which it was to be driven. \*

If this Force should be weaker than ordinary, it may not be of

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\* Vid. Dr. Drake's Anatomy of the Liver.

sufficient Vigour to break the Connection of the Blood, by driving it into these narrow Pores of the Parts, where it is as it were to be modify'd anew, and to whom they owe their present Form, Configuration of Parts, and Structure.

For this Reason Man seems to be supply'd, as was said before, with an Artery larger than in other Animals, to quicken the Motion. As for the first Reason, the Blood, to break its Force, takes its Circuit thro' the Spleen; for whatever over Alterations have been imagin'd to have been made in the Blood by its passing thro' the Spleen, these only at present are prov'd, *viz.* that the Force of the Blood is broke, which by the *Porta* is to go from thence to the Liver. And secondly, that there is a Separation of Lymph made here, as appears by the

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Lymphæ-Ducts, (with which this Bowel pretty much abounds\*) and which possibly, by taking somewhat from its Fluidity, may be a farther Bridle to its Motion.

That Anatomists should impute those Coagulations they have observ'd in the Bile of Bodies, that have not their Spleen taken out, to its Extirpation, I see no certain Reason; they may be Accidents and Effects owing to no such Causes. But if it must be so, it is as free for me to suppose, that it is for want of Lymph to keep the Bile diluted; for tho' the Blood loses some of its Lymph in the Spleen, yet it does not do it proportionably to what it does in the other Parts that feed the Liver with Blood by the *Porta*.

The Bile being thus separated in the Liver, and carry'd partly to the *Porus biliaris*, and partly

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\* Vid. Mr. *Comper's* Anatomy, and *Nuch's* Adenographica.



to the Gall-bladder by proper biliary Ducts dispers'd thro' its Substance, are by them to be convey'd to the Intestines ; where our next Inquiry will be about the Use it bears in the Animal Œconomy, which is, in my Opinion, for the Subtilisation and Attenuation of the *Chyle*, or dissolv'd Mass of Aliments sent down to the Intestines from the Stomach.

To this Purpose there seems to be one part of the Bile carry'd to the Gall-bladder, which is to be preserv'd against those occasional Times, and where by its stay it contracts likewise a greater Acrimony, and becomes a more powerful Dissolvent.

In these periodical Evacuations of the Bile, I cannot conceive the Gall-bladder to be any thing concern'd in sending it to

the Intestines ; there being no muscular Coat here to assist it, and promote its Contraction, as we have before observ'd.

The Bile then being thus press'd into the Intestines, it there mixes with the *Chyle*. I think it is wholly owing to the Pressure of the adjacent Parts, which is particularly promoted by Inspiration, and in the times the Stomach is distended with Aliments, and which in the Distribution of them to the Intestines, squeezes the Gall-Duct from this Bladder. From hence the use of Vomits in a *Jaundice* may be accounted for ; where by Virtue of its penetrating lixivial Salt, it farther dissolves the Aliments, which being still more subtiliz'd, and as it were, alcaliz'd, gives a greater Opportunity for the Lymph of the Stomach and Intestines to enrich themselves with their nutritious

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ous Parts ; with which being impregnated, it may easily be conceiv'd to be taken in at the Mouths of the Lacteals without any suppos'd Fermentations or Precipitations. The thinner and more profitable Parts of the Aliments being thus taken by the Lacteals ; the thicker, which were incapable of entering their Mouths, are dispatch'd away by the Intestines, and which by their peristaltick Motion are as serviceable in forcing the *Chyle* into the Lacteals, as the Fæces downwards.

In promoting this Motion of theirs, the Bile seems not so much concern'd, as has been imagin'd. For besides, that it is not probable, that thus diluted with the *Chyle*, it should be of that irritative Nature to provoke the Intestines, which when sincere and unmix'd in a sound State, gives no Disturbance at all to the Coats  
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of its *Cystis*; which appears to be as sensible as those of the Intetines; and we see in cœliack Passions, where there are plenty of Stools, by the colour of the Fæces, that the Bile has little to do with them. But Dejections are chylous, and appear to proceed from a want of Bile to attenuate the *Chyle*, and make it fit to be receiv'd by the Lacteals; as may be conjectur'd from the Method of Cure where Practice directs us, as in Cases of Obstructions such Medicines as attenuate. *Borellus*, from a Consideration of what Blood pass'd thro' the Liver in every Circulation, which by the Proportion of the Diameter of the Blood-Vessels, he thinks to be about a twenty-fifth Part; as also from the Proportion that the Bile bears to the rest of the circulating Humours,

mours, which he judges to be about a tenth Part; and likewise contains the Quantity of Bile, which in every Circulation of the Blood thro' the Liver, must needs be separated there, in as much as these bilious Ducts are free and open, as those of the exporting Veins are; that therefore they will carry in them their full Quantity of Bile proportionably to their Diameter, which, in the compass of a Day, will be in Quantity sixteen times more than is contain'd in the whole Body, the Bile being made from *Chyle* only, according to him. He concludes, that there must be a Necessity of Circulation of it; and that the Bile is taken up from the Intestines by the Meseraick Veins, and there with the Blood remanded to the Liver.

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But, with the Leave of this great Author, it must be said, that whatever Necessity there is for supposing a Circulation of the Bile, it cannot be return'd this way to the Blood; because it is evidenc'd by Anatomy, that nothing is convey'd to the Blood from the Intestines, but by the Lacteal-Vessels alone.

And secondly, that no Liquor does enter the Lacteals in a natural State in the form of Bile, as appears by the Taste of the *Chyle*. And thirdly, that no Lacteals leave any nearer Passage to the Liver, than by the Heart.

But farther, he uses no convincing Argument to persuade us that the Bile is not made from the Blood. The Instance, I am sure, he gives of Serpents, whose Gall-bladder, and *Porus biliarus* will be as turgid with Bile, after  
several



several Months fasting, as at any other time, argues to me, as if the Matter of Bile was in the red part of the Blood. And that it is not without Grounds, what has been asserted, that the Bile and red grumous part of the Blood do differ in nothing but a greater or less Attrition and Attenuation, which repeated Circulations will bring about.

Thus we see in hot Constitutions, where there are high Pulses, and brisker Circulations, the Constitutions are likewise more bilious, and the Persons that have them are more incident to Distempers of the Bile. But to pursue this Instance farther; if Bile can be allow'd to be made of *Chyle* only, or some Parts of the Aliments fresh taken, there certainly would have been, for want of Food after so many repeated Circula-

culations, a Scarcity of Bile; which was not the Case here, after so many Months fasting. For, according to this great Author, a small part of the Bile is carry'd down with the Fæces in every Circulation, which lessens its Store dy degrees; the contrary whereof is here experienc'd.

I might farther deny, (for he has not prov'd it) that the biliary Ducts are always employ'd in their full distended Capacities. They may indeed be so, when there is Bile enough to fill them. But this does not prove a Necessity of their always being so; but they are so contriv'd, that be the Quantity of the separated Liquors more or less, they are sufficient to convey away what is deliver'd to them by the Glands.

But still, in one Sense, it may with Safety be affirm'd, that a  
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great part of the bilious Mass returns again to the Blood ; and that by the Lacteals too : For as by the Analysis of the Bile we are inform'd, that it consists of a great deal of Water, a little Oil, and a little Salt ; this Water, which is the lymph or serous part of the Blood, and which indeed is the greatest part of it, and of very great Importance, in consideration that it is a Vehicle for the Parts it dissolves, as was before observ'd speaking of *Chylification*.

This Lymph then, we may affirm, does the same kind Office to those parts of the Blood, with which being join'd, it has the Denomination of Bile ; which it keeps sufficiently diluted, becomes their Vehicle, and being well mix'd, gives them Conveyance to the Intestines ; where being  
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mix'd with the Contents there for the Purpose abovemention'd, such Parts of it as are fit to pass thro' the Colatures of the Lacteals are suck'd up, in order to be return'd to the Blood. But as was before observ'd, not one drop of it under the form of Bile, in a sound State at least.

The Bile, as it offends either in Quantity or Quality, oftentimes brings very great Disorders upon us.

For as in our natural State, when the Blood abounds with bilious Particles, yet not to that degree, so as to interrupt the Regularity of our Actions in the Animal Œconomy, which would be to make a Disease ; but gives that sort of Constitution, that the Ancients call'd hot liver'd : We find by Observation, that our Bodies are always liable to hot Diseases ;



Diseases ; such as Fevers, &c. and on the other side, where these active Parts are not so abounding, they are dispos'd to cold Diseases, such as Obstructions, Cachexies, &c. so in a preternatural State, how the Alterations are produc'd, may be easily accounted for ; the too great Quantity of it making the Blood more fluid and spirituous, as the want of it is more viscid in consistence, and less active.

That the Bile offends in Quality, may be granted, I presume, from the Alteration of the Colour, which is made in its preternatural State. Its natural Colour is Yellow ; but in a morbid State it will turn from that to a deeper Yellow, and so from a lighter to a deeper Green, so to a black Colour ; as may be seen by the Experiment of mix-

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ing Acids with it ; which they likewise coagulate (and as hath been seen) into a Substance not extremely unlike to Stones taken out of the Gall-bladder. The Affusion of Spirits of Hart's-horn, will redeem it from its Coagulations, when it is lightly so. But whether any Liquor in the Form and full Force of Acids can get to the Bile in the Liver, I think may be fairly question'd : But it is certain, it may meet them in the Intestines and Stomach, where (according to the degree of the Fermentation they make with it) they may produce either Flatulences, Vomiting, the Cholera Morbus, Diarrhæa and Dysenteries, according to the Parts affected, and where these heterogeneous Liquors meet.

From the Effervescence made by the Bile with the other vitiated

ted Humours, Flatulences frequently ensue, which will very well account for a great Number of the Symptoms of hysterick and hypochondriack Persons; as we see hysterick Colicks oftentimes terminate in the *Jaundice*.

From this Fermentation of the Bile, with the vitiated Humours it meets with in the *Primæ Viæ*, the first Symptoms of Fevers may be very well explain'd, and also several of the consequent ones, as is own'd by Practitioners; and it may be from the Speculation of the periodic Evacuations of the Bile in the Gall-bladder, the Doctrine of intermitting Fevers may be better establish'd, than it hitherto seems to have been. But to prosecute this as it should be, requires a longer time than is reasonable for me to take now;

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Therefore, I shall conclude, and  
leave these Hints only to your  
farther Consideration.

*F I N I S.*



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